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CIRCULAR FORM CUTTER DESIGN—I

James L. Ingalls

Tool design is often subject to rule of thumb or left to the toolmaker's experience. The fundamentals appear to be imperfectly understood or are for other reasons neglected. This article, the first of two, presents facts on form cutter proportions which should remove the guesswork from the design of this class of tool

THE DESIGN of a circular form cutter is not an easy task, particularly for those with limited experience. Even among older designers, frequent examples may be found where practical principles have been ignored. Such faults as these are common: the wrong cutter diameter is chosen; gashes are made too deep, weakening the teeth; the radial relief is too large or too small either of which results in frequent grinding. Any of these errors will make a cutter short lived. Often a draftsman will show the required form, guess at the outside diameter, approximate the number of teeth, and then send the drawing to the toolmaker, who must do the rest of the guessing.

The outside diameter should be as small as conditions permit, because other things being equal, a cutter with a smaller diameter will produce more than one with a large diameter. Besides, the smaller cutter can be made more cheaply. A cutter's outside diameter is based on three factors (Fig. 1): the diameter of the above hole H; the stock required between the arbor hole and the bottom of the gashes M; and the depth of gashes G. Then:

Outside Diameter $= H + 2M + 2G$.

The diameter of the arbor hole H is fixed by the equipment on hand. The stock M, between the arbor hole and the gashes, may safely be taken as half the arbor hole for medium heavy work and $\frac{5}{8}$ the arbor hole for heavy work. In special instances, M must be increased so the arbor will clear some projection or lug on the work or fixture. The depth of gash G may be determined from the chart shown in Fig. 2 using the greatest depth of form on the cutter. When the

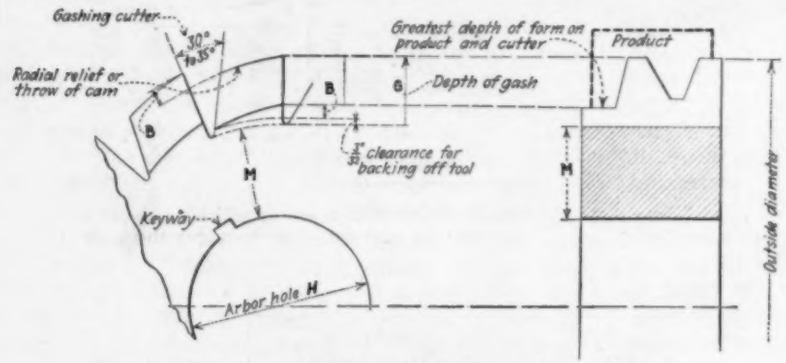


Fig. 1—Certain proportions should be maintained between arbor hole, depth of gash, radial relief, and outside diameter for efficient cutter performance

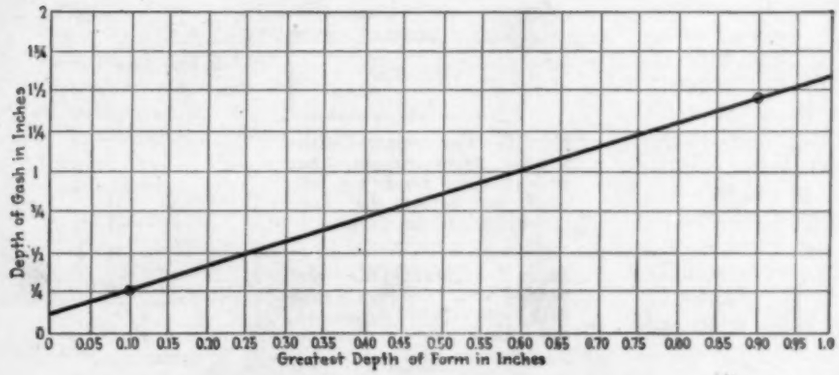


Fig. 2—The depth of form is fixed by job requirements. From this the gash depth may be conveniently obtained from this chart

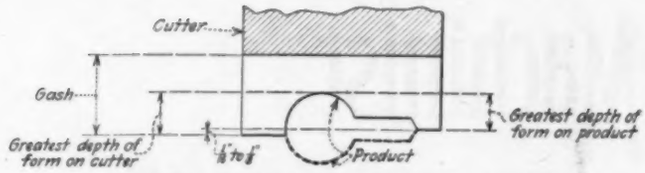


Fig. 3 — The depth of form on the cutter rather than that on the product must be used as the basis for cutter dimensions

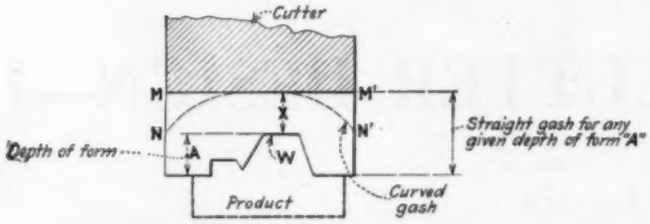


Fig. 4—The use of a curved or irregularly shaped gash bottom may add materially to tooth strength

outside diameter is found, the approximate number of teeth may be obtained from the following:

$$\text{Number of teeth} = \frac{\text{outside diameter} \times T}{\text{depth of gash} \times 1.5} \qquad (2)$$

This formula will often give a fractional or odd number of teeth. The nearest even number should be selected to facilitate measurement.

The next step is to determine the cam throw for radial relief. Fig. 1 shows that the depth of the gash is dependent on:

1. The greatest depth of form.
2. The cam throw.
3. The clearance for the backing-off tool, $\frac{3}{32}$ in.

Since the first factor is given and the third is constant:

$$\text{The throw of cam} = \text{Depth of gash} - (\text{Depth of form} + \tfrac{3}{32}) \qquad (3)$$

The figure obtained may be modified somewhat to suit a cam on hand for the backing-off lathe. The clearance for the backing-off tool is given as $\frac{3}{32}$ in. After using this figure in Formula 3 to find the cam throw, it may be reduced to not less than $\frac{1}{32}$ in. by increasing dimension M if so desired.

The greatest depth of form is often the same in both product and cutter, as shown in Fig. 1. But this is not always the case as shown in Fig. 3 where the cutter is allowed to overlap the cutter of the piece cut to remove burrs. The greatest depth of form on the cutter must be used in finding the depth of the gash from the chart in Fig. 2. The gash is ordinarily cut with the bottom parallel to the axis of the cutter as in Fig. 2, but may be given an irregular contour to strengthen the cutter teeth as in Figs. 4, 5, and 6. In Fig. 4, M-M' shows a gash with a straight bottom, and N-N' one with a curved bottom. The points of runout of this curved or irregularly shaped bottom must not be above the bottom of the form at W, so the grinding wheel may pass and sharpen all points of the cutter form. The limit of the bottom of the gash is that no point shall be nearer the forming surface than the amount of relief plus $\frac{3}{32}$ in. This distance is shown by the letter X in Figs. 4, 5, and 6 and must be measured in a line parallel with the side of the cutter. In designing the shape of the gash bottom it is of course advisable to select a shape that may be milled easily.

The cutter in Fig. 5 has a 3-cut gash and may be sharpened in two passes of the wheel, that is, along lines FG and EH. In Fig. 6, the gash bottom has a more irregular shape. The form runs off this cutter at an angle where P is the length of the angle in the plane of the cutter side. When one or both sides of the form run off at an angle, it is not necessary to determine the gash depth from the dimension P, as any convenient value of X may be used. So the standard depth of gash is based on some other depth of form as at A. This will give a value for X which is laid off at the other side of the cutter at the point where the angle runs out as shown in Fig. 6. Point O is laid out from point S in the form, and the line MNO will be the contour of the gash bottom. This may be modified as shown at MTO. Both these contours require 2-cut gashes and may be ground in one pass of the wheel along the line CD.

When both sides of the form run out at an angle and there is no irregular shape between them, the depth of the form may be assumed as zero and any value of X selected as in Fig. 7. For this type of cutter, the general procedure is to select any desired throw of the cam and to add clearance for backing off the tool which will give the depth of the gash or X. Thus any value of X may be obtained by assuming a corresponding value of cam throw plus tool clearance. The cutter illustrated has a 3-cut gash, and three passes of the grinding wheel are necessary for sharpening. These are merely suggestions as the designer may select many other suitable contours for the bottom of the gash.

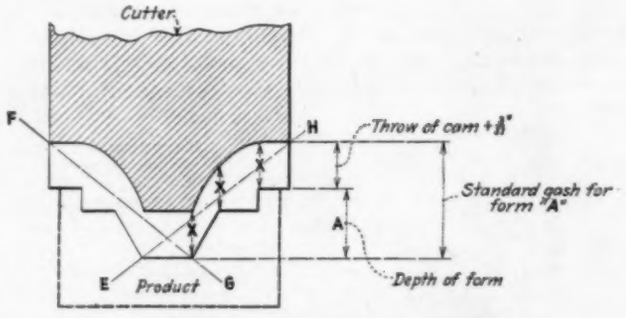


Fig. 5—Regrinding economy as well as tooth form must be considered in designing the gash

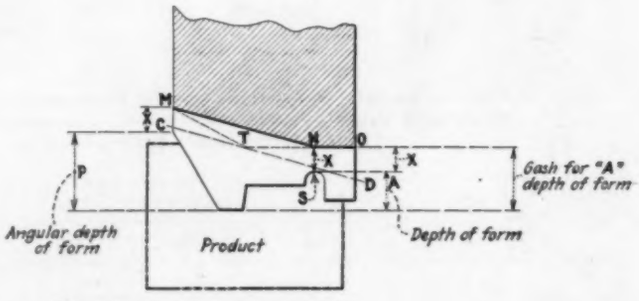


Fig. 6 — For cutters with angular form runout, the gash bottom need not always be below the low point on the form

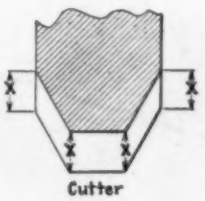


Fig. 7 — Three cuts are needed to produce this gash and three passes of the wheel are required to sharpen the tooth

PRESS TOOLS FOR SHEARING AND SHAVING

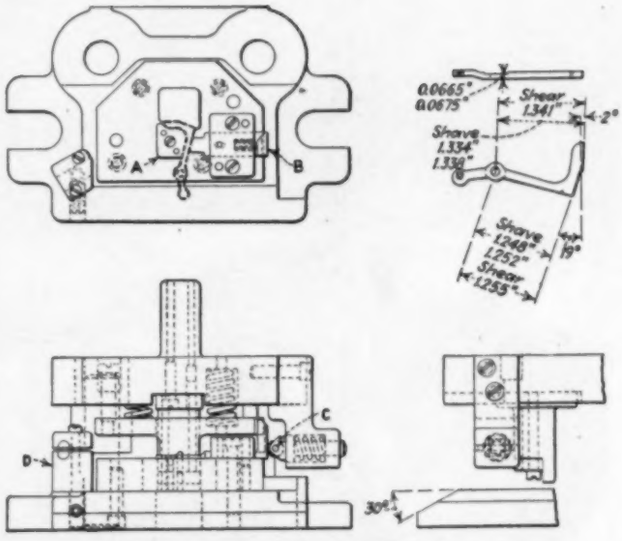
W. H. MALLIET
Supervisor of Design and Development
The Royal Typewriter Company

THE MEANS of obtaining a smooth finish on the sides of small blanked steel parts for typewriters and adding machines requires much thought when laying out the tool operations. If the side surfaces must be exact to a thousandth of an inch from a center hole or other point of departure and smoothness is essential, there is quite a problem to be solved. Because of their large use of brass for blanked parts, many makers of adding machines and a number of clock manufacturers, use shaving dies to obtain a smooth finish on their work. But there is often a question as to the advisability of their use on parts blanked from steel because of the cheapness of milling the edges of the pieces in multiples of six or eight at a time, holding them in a cam-operated vise.

The tool designer should always remember that there are certain expense items to be considered, one of which is the cost of the milling cutter and the vise jaws compared to that of an aligning-pin shaving die. A second item is the expense of burring the last piece when the parts are milled in multiple. Another point is that the punch and die must have their cutting edges kept sharp, which means the cost of die upkeep against cutter upkeep. An important consideration in determining whether shaving or milling the part will be best, is the nature of the part itself. Are there surfaces directly in back of the edge to be shaved, for which backing-up plates can be provided on the die? Are there holes directly in back that can be provided with pins to take the back push on the shearing punch?

It should be remembered that from 0.006 to 0.008 in. must be removed from the side of the blank to take out the die marks. It is not possible for a shaving die to take off more than 0.003 in. of metal and leave a good surface; therefore it is sometimes necessary to shave a part two or three times to eliminate roughness from the sides of the blank. A milling cutter having a true outline and sharp teeth will do the trick when passed once over the work at the correct feed. A part cannot be shaved to a nicety if it is much over 0.090 in. in thickness. All these considerations must be weighed.

A shearing and shaving punch and die that have proved very satisfactory, and on which the cutting blade is made to do two operations at one stroke of the press, is illustrated as being worthy of the tool designer's study. A sketch of the part that is sheared and shaved in one operation in these tools is given in the upper right-hand corner of the illustration. Thousands of these parts have been made with a saving that has doubly paid for the cost of changing over from milling in one year. This part is an ideal one for quick locating and proper backing up when shearing and shaving.



When accuracy and surface smoothness are wanted, a shaving punch may be the solution

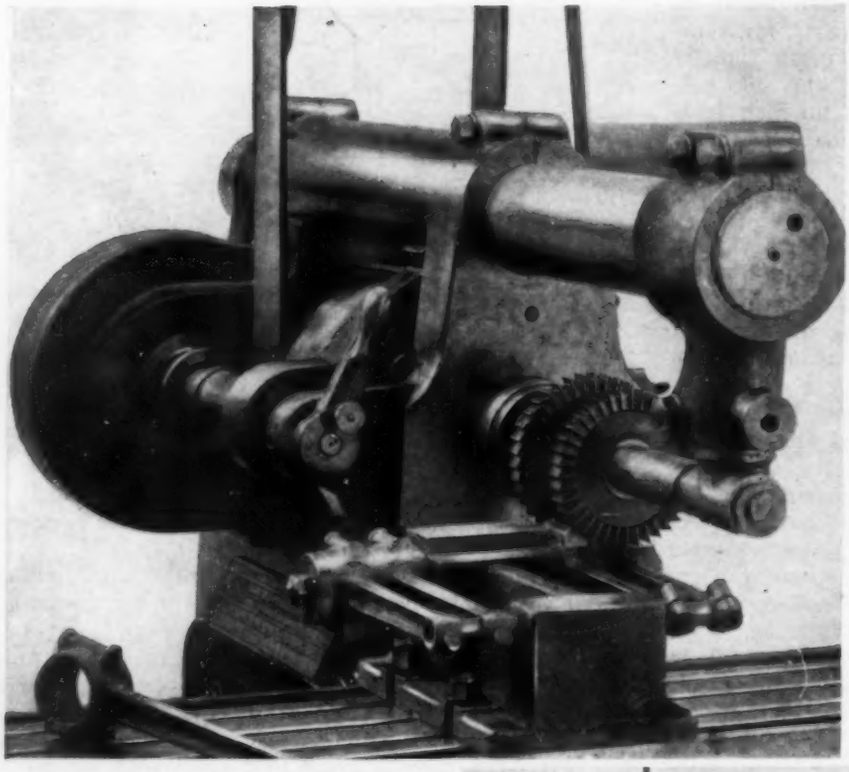
The part is located over a pin and up against the nest plate *A*. To insure its being against the plate, the spring slide *B* is provided on top of the die. The spring is used to return the slide for clearance when locating the part. The slide is made to contact with the work and to push it against the nest plate by roller *C* on the punch holder before the cutting punch comes in contact with the work. The punch is made in two parts, the lower part being the shearing block and the punch proper being the shaving unit. This construction means that there is a distance of 0.003 in. from the die edge to the cutting edge of the shearing block, and 0.001 in. to the cutting edge of the punch.

The work, when sheared, projects over the die edge about 0.004 in., but the stiff spring on the stripper plate prevents the work from tilting. It may be noticed that the back ledge of the punch is made to enter into the die for support before the shearing action takes place. The shearing block is held on the shaving punch by a screw and a dowel in such a manner that both may be easily removed for sharpening. The blocks *D* are for holding an air pipe. One of the features that contributes to the success of this tool is the blowing of the chips from the die and the cutting punch after each stroke of the ram.

20 Years of Production Progress

S. E. BERGSTROM
Milling Specialist

Connecting rod milling exemplifies the rapid improvement in machining methods.



SO ACCUSTOMED have we become to progress in machine shop practice that consistent improvement is accepted as a matter of course. However, a view in retrospect holds much of interest as shown by the photographs in these pages. By a series of cross-sections, the twenty-year advance in the art of milling is illustrated. This is simply one of many stories that could be traced through the years.

The example used is the operation of splitting caps from automobile connecting rods and milling the bolt bosses. The general design of these rods has

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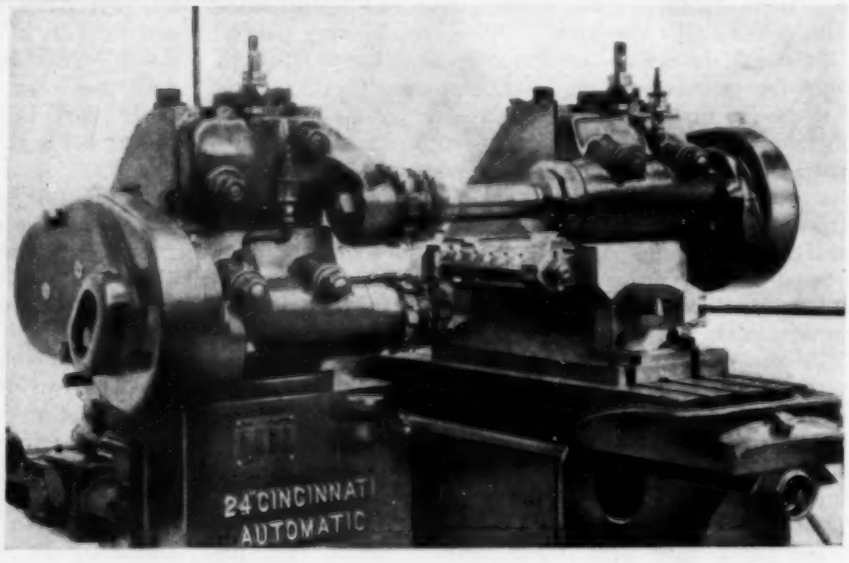
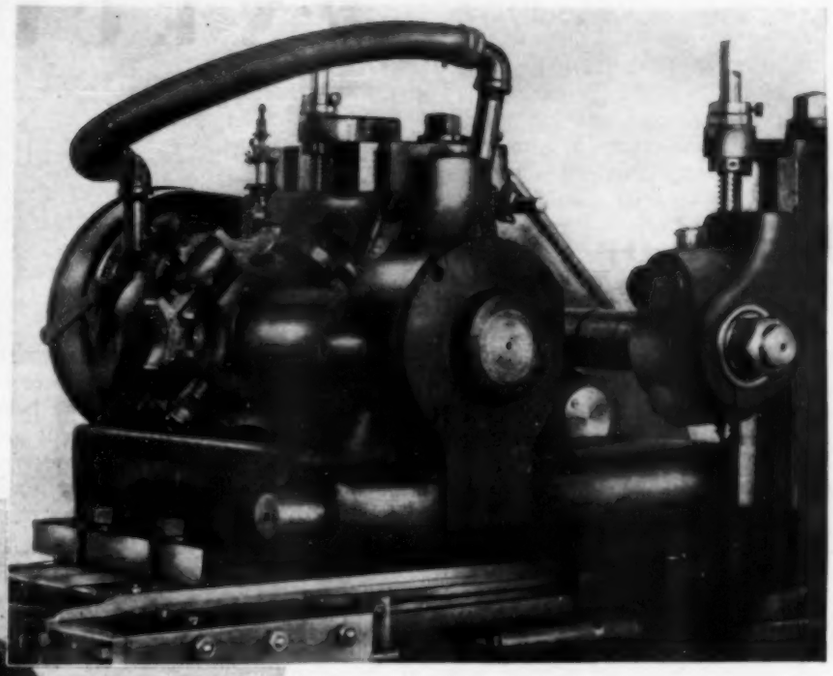
Photographs by Courtesy of
The Cincinnati Milling Machine Company

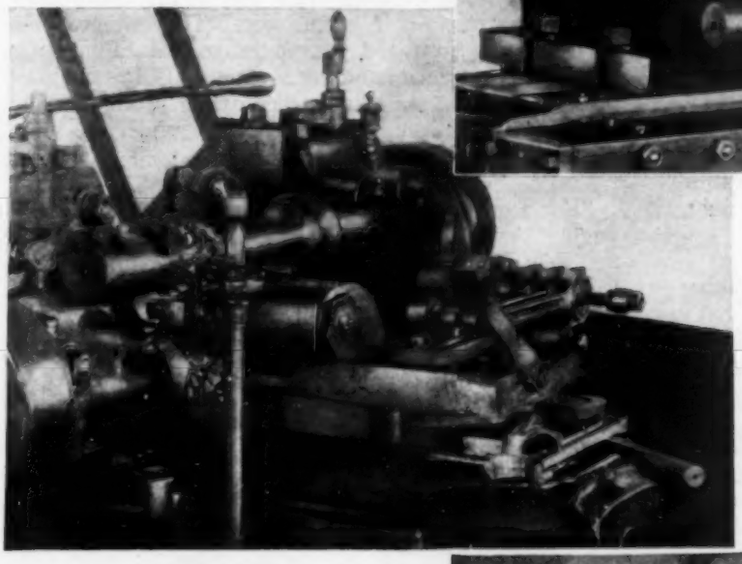
1910 — 40 AN HOUR — Bolt bosses were straddle milled with a feed of 0.85 in. per minute. A crude fixture enabled the operator to unload one pair of rods while cutting the other. Splitting the caps was an extra operation. The rods were turned over to mill the bosses on the other side.



1915 — 60 AN HOUR — An indexing fixture, holding three rods at each end, increased production 50 per cent. In addition, the splitting operation was included and both sets of bosses faced simultaneously. The feed was stepped up to 3 in. per minute. A weakness was the difficulty of grinding cutters to cut the bosses symmetrically

1928 — 125 AN HOUR — Continuous operation and a sharp increase in production was achieved by using the drum principle. One gang of cutters, working between a pair of rods, reduced set-up time. The drum was indexed automatically between cuts, but the feed remained at 4 in. Since the duplex machine was no longer needed for this method, machine tool cost was lessened.





1920 — 90 AN HOUR — Further time saving was gained by using a simplified fixture in the same machine. A removable jig unit, holding six rods, was loaded while another set was under-cut. Increased rigidity allowed a 4 in. per minute feed. The cutter set-up was unchanged and retained its former shortcomings.

changed but little, so the operation has remained practically identical. A slight decrease in size over older designs is more than offset by the steels now used, which are harder and tougher than formerly. Although the machining time varies for different makes of rods, the comparison is not affected appreciably.

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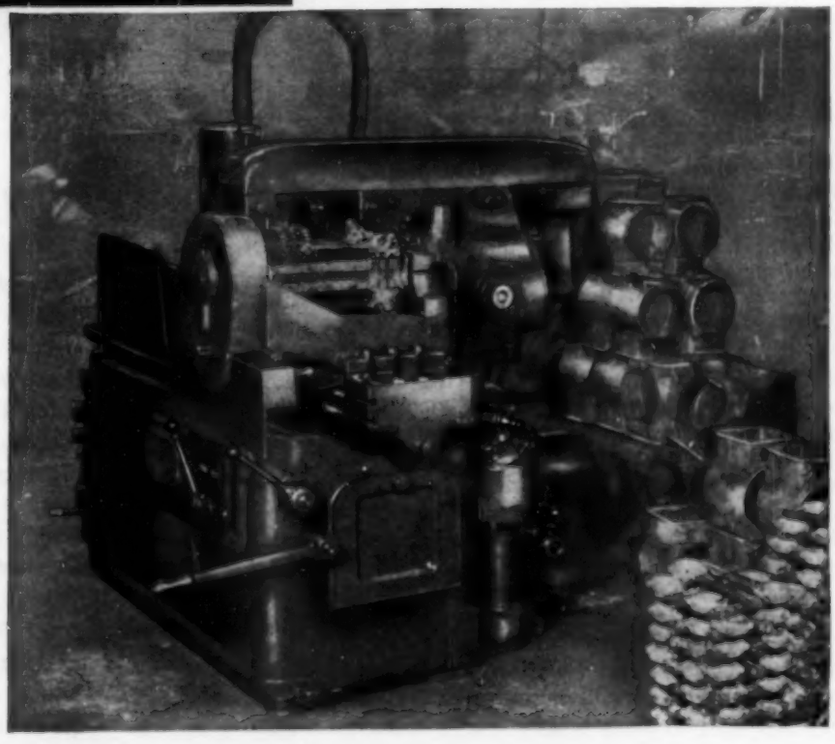

1930—200 AN HOUR—Further drum refinement forms the last word in rod milling. Clamping, unclamping, and indexing are entirely automatic. The hydraulic feed is varied to meet cutting severity resulting in an average of 6½ in. per minute. Cutter blows are cushioned by the oil column. Interchangeable studs make this fixture almost a standard product.

EXECUTIVE FORUM

Dealer or Direct?

"BUCK UP, old man," said Bill Holland greeting Frank Wallace in the lobby of the Hotel Lorraine. "Salesmen should look cheerful."

Indeed the sales manager of the Viking Tool Company seemed to have lost his customary cheerfulness. He managed to force a smile in appreciation of his friend's buoyant spirits, but only for a moment.

"Trouble always comes in bunches," Wallace complained. "I can wear out shoe leather looking for orders when there aren't enough to go around and come back smiling. But an internal scrap at the same time gets under my skin. I feel that I've two battles to fight, one inside and one outside."

"What's wrong?" asked Bill. "I thought the Viking internal organization ran like clockwork."

"More like a cuckoo clock," said Wallace. "Graham, our president, has an assortment of pet theories which he dusts off one at a time and threatens to put into practice. Then it's up to the department head affected to find some way to head it off. Right now I'm the victim, and the situation's getting serious. The proposition is to put all our sales into the hands of dealers."

"That should save you a lot of trouble," said Bill.

"I suppose a general would have less trouble if he had no army to worry about," said Wallace, "but it would take the joy out of his job. I'm not concerned about my own position because Graham made it clear that we'll need a sales manager whether we sell through dealers or direct. But I'd hate to see the organization, I've built up, cast adrift. My men are doing good work under adverse conditions."

"Why does Graham want to sell through dealers?"

"The idea of a fixed unit selling cost appeals to him," said Wallace. "I've thought it a wise policy to keep full pressure on sales despite the depression. I still believe I'm right, but it looks as though this course would work against me. Naturally, sales expense has gone up, and it's true that, under present conditions, dealers could save us money. But Graham forgets the savings we made when business was flush."

"A uniform sales cost is a big advantage," said Bill. "I'll agree that keeping your force together is advisable if you intend to continue direct selling, but then your costs go skyward. That aggravates the effects of the depression on your earnings."

"You seem to agree with Graham," said Wallace, "but there are some angles you haven't considered. The sales force helps the company in a great many ways for which it gets little credit. Its suggestions for design changes from the customer's viewpoint are highly important. Our salesmen know the product thoroughly and concentrate on it exclusively. They are capable of estimating jobs and of rendering real engineering service. An agency handling a variety of lines couldn't possibly have the same knowledge of our product or the same interest in selling it. It couldn't render the same service to the customer or to us."

"But a good agent will cover the territory more thoroughly," said Bill. "He has so many sources of contact that few inquiries escape his notice. Sales in one line lead to sales in another. The manufacturer profits by the dealer's good will as well as his own. As a result the cost per sale is usually lower."

"Lower on the business we get," said Wallace, "but our sales would be lower too. In our line, it's necessary to do a lot of missionary work to lay the foundation for future orders. As a rule, dealers aren't interested in efforts in that direction. They want quick sales and quick commissions."

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What Do You Think About This Problem?

Some regard the middleman, or dealer, as a superfluous step between the manufacturer and the user of machinery. Others consider the dealer as a medium for increased sales efficiency because his organization can handle a variety of non-competitive lines on a scale that would be prohibitive to the individual manufacturer. Which method of selling is less costly? Does direct selling result in better service to the consumer and a more sensitive market reaction to the manufacturer?

. . . Discussion

of Executive Problems

Promising Performance

If a salesman says a machine can produce at a certain rate, he cannot logically refuse to put such assertions in writing. He should be careful at all times that he does not promise more than the machine can do under general average operating conditions. I do not see why a guarantee could not be given providing it is worded carefully and in language that cannot be misunderstood. Any unusual operating conditions in the buyer's plant could be mentioned in the guarantee and safeguarded against. The buyer, placing an order for a machine, is interested in getting equipment which will lower his production cost, and if the machine is actually profitable for him, he will not reject it on frivolous or insufficient grounds.

—H. GREENHALF,
Ford Motor Company of Canada.

Misguided Loyalty

What kind of loyalty would you have, if the works manager, superintendent, and foreman felt that the bosses higher up were snooping around to someone under them, trying to find out how they were working, or wheedling confidences dropped in an unguarded moment? If the boss wants to know anything about a man, let him go to him and ask him directly.

If a man is slipping, it is the boss's job and a fairness to the man to call him on the carpet and tell him that he must do better; not sneak around to a man under him and get the information that way. Loyalty cannot be bought or demanded. It takes years of fair, upright, straightforward dealing.

—WILLIAM D. PLUMB, *Factory Manager,*
Fayette R. Plumb.

One Big Family

Let a man take care of his own social activities. He spends the greater part of his time with the men where he is employed, and perhaps would prefer to make his friends outside of the shop. When a firm promotes a social club, the men feel that they are obliged to become members, even though they are not interested in it. By all means leave a man's outside activities to his own inclinations.

—J. WALTER WRIGHT, *Assistant to the President,*
Wilmot Fleming Iron and Steel Company.

No Change

Any action on the part of a group of manufacturers to limit arbitrarily the freedom of choice of employment by labor is almost certain to react unfavorably on the morale of the labor group. History shows that this problem of labor turnover was present as far back as 400 B.C. in the shops in China. If turnover is excessive, it is a good plan to look close to home for the causes. A check may reveal an inadequate training program for new employees, poor foremanship, unbalanced wage schedules, unjust task standards, or poor working conditions.

If the community is overrun with "floaters," an agreement might be used between manufacturers involving the use of a standard record card, to be filled out by each successive employer stating period of service, kind of work, results obtained, and reason for leaving. This procedure would not handicap the good worker making a change for the betterment of his condition or those forced to change because of business conditions, but would soon show up the chronic searcher for greener pastures.

—W. B. LINCOLN, *Chief Engineer,*
W. J. Savage Company.

Brain Fag

In Vol. 74, page 239, U. Seth Eberhardt indicates that a designer does not need time to think. The writer has been designing special machinery for several years, and does not believe that there is any way to tell how fast one can think out mechanical ideas. To design a machine, the designer must see that machine working in his own mind. If there were only one way of making a machine, designing would be much easier. But the designer must direct his thoughts to the best way of making the machine and should also be a practical mechanic in order to get that machine through the shop with the tools available. The very best thought comes to a man in the quiet of the home, but a designer can't store away all the ideas needed the next day to keep him busy on the board without stopping to think out a problem.

—R. C. SHEPHERD.

Nothing is more fatiguing than concentration for a long period over some new design, and especially something which is wanted in a hurry. When there is pressure from above, and everyone is anxious to see the work completed, a designer is likely to be on edge, and nothing is more disturbing to a competent man than to have someone watch him. Perhaps leaving the office and strolling around the streets is a little too much of a display of temperament, but there are other ways of providing the necessary relief. Too many firms look upon creative work of this nature in the same light as production work upon a machine, where, by increasing the r.p.m., the output will be correspondingly increased.

As to providing regular rest periods, this would be a rather mechanical arrangement, and should be unnecessary. A method which would be far better is to allow each man to be his own judge so long as he does not take undue advantage, and give him the liberty of a certain amount of relaxation whenever he feels the need. The quality and quantity of work turned out, rather than con-

tinuous unbroken hours at his post, should be the basis of judgment. One of the best methods of relieving fatigue after a concentrated mental effort, is to enter into a discussion of the problem with one or more interested persons. —P. H. WHITE, *Mechanical Engineer.*

Dole or Control?

To control business to the extent of giving employment to the majority at a fairly constant scale, would require a finer organization than the best of armies during war times. Everybody connected with business would have to do exactly as directed, no more nor less.

As this is impossible, at least in this country, we will continue to have ups and downs in business indefinitely. Last year during the peak in business, every one was getting all possible and many lived on this plane while it lasted. If a group of big business men had attempted to steady this mad scramble, they would have been howled down. Now the masses look to big business to restore confidence and prosperity.

The English dole does on a national scale what in this country is done by cities and towns as welfare work. It is in reality charity paid out of taxes.

—L. F. SWENSON, *Industrial Engineer, Perkins Machine & Gear Company.*

On With the New?

In filling a position of responsibility, the essential thing is to use every effort to secure the right man for the job. Apply that test, and it follows that if there is already a man on the spot eminently qualified to fill the post that man will be offered the job. It often happens that for some reason or another he is overlooked and an outsider called in. That is unwise, because a stranger is at best an experiment. Even if a man has done well with another firm, it does not necessarily follow that he will make good with a new one. If the good man immediately at hand is not given his chance, it is of course possible that his excellencies are not known to the officials responsible for making the appointment. But, and this is important, there ought to be machinery whereby the good men are recognized and ear-marked for prospective advancement. Companies simply cannot afford to remain ignorant as to the real worth of their best men. It ought not to be necessary for men who make good to get all their recognition from competitors. —W. R. NEEDHAM, *English Electrical Company, Stafford, England.*

Football may be a hobby with John Edwards, but he seems to have missed the fundamental principle of the game and particularly its application to his business. No individual player, no matter how good he may be, can get very far without the full co-operation of the other ten players. When one player is substituted for another, the fresh player going in is not taken from some other team, but is a member of the team upon which he is to play and knows his part in every play.

Team work is just as essential in business as in football; therefore Mr. Edwards should promote Turnbull to be assured of harmony. Another man may be a brighter individual star, but the entrance into a business of an imported star is likely to be as disastrous as it would be to a football team. The new ideas should be furnished by Edwards and he can secure valuable assistance along this line from Turnbull and others in his organization if he will see to it that they read the right periodicals and occasionally visit other plants, particularly plants engaged in lines of business entirely different from his own. —C. J. MORRISON, *Consulting Engineer, Meyer, Morrison & Company.*

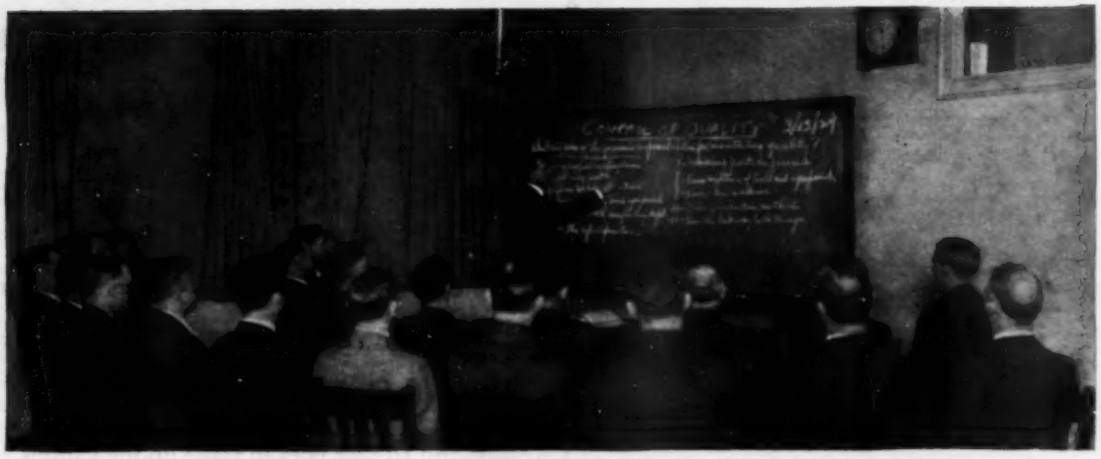
Convenience or Confusion?

The adoption of the metric system would be costly, and the further we progress with machinery and appliances the more costly the change will be. But the question is: "Is such a change worth the cost?" Since the metric system is a decimal system great simplifications would be possible in measurement, in calculation, and in education. International trade would be facilitated. The initial capital outlay expended on the change might return good dividends. Before the question can be satisfactorily decided, much research is necessary. In England, committees have reported favorably and unfavorably on the metric system ever since the first Royal Commission on the subject reported in 1819. The latest committee was the Committee on Commercial and Industrial Policy after the War, which in 1918 reported against its adoption. It was unable to perceive even theoretical advantages in the metric system. All these various bodies seem to have done is to make collections of opinions. That done, they proceeded to formulate their own opinion, which they embodied in a report. Such a process does not settle the question. It may be possible to decide the matter by demanding the evidence of manufacturers and distributors, as to the costs which will be incurred and the savings which will be made should they adopt the metric system. —A. W. KNIGHT, *Ipswich, England.*

Food for Thought

Factory lunchrooms should be classified with factory hospitals and welfare work. Beside the advantage of having the men talk shop, there are other cash return values. A good many times, customers' representatives will call. It makes a good impression and adds to the prestige of the company to point to an attractive cafeteria and a lot of time and expense will be saved by entertaining these men there. Naturally a hotel or a first-class restaurant is better, when an important customer or representative stays over for dinner, but we have numerous foremen and operators call who prefer to eat at our cafeteria than to go out to a place where they would not feel at home.

Considering the advantages of time and money saving, and the promotion of good will, a part of the cafeteria expense might well be charged to the sales department. It has already been established that the factory gains. The engineering department may profit by shop talk, and with the additional advantages of accruing to the sales department, a small cash loss may properly be distributed as general overhead. —J. C. P. BODE.



The Modified Foremanship Conference

A. R. Pierce
Director, Department of Industrial Education
National Metal Trades Association

THE MODIFIED foremanship conference plan has been successfully used during the past few years in many member plants of the National Metal Trades Association. This plan differs from the original conference plan which was conceived by Charles R. Allen and his associates to the extent that it provides for the use of suitable supplementary text material. The Association's Committee on Industrial Education urges the membership to use proper text material because it has been found possible to increase the effectiveness of a foremanship conference program through this medium.

Text material to be proper must be practical and founded upon sound principles and proven ideas. It must be sensible, not too difficult, yet not so elementary that it discounts the intelligence of the foreman of average level of mentality. An outstanding fact that has been confirmed by careful observation is that text material prepared by groups of practical executives of industrial plants is far superior to that prepared by individual specialists or professional book writers. It is not surprising that this is true because it is usually necessary for one to go through a school of actual experience before he is qualified to tell others the best way to do things.

The foremanship program, briefly stated, operates as follows: Candidates for the position of conference or group leader are selected from the plant personnel of the company that elects to set up a conference program. These candidates are instructed and coached by a National Metal Trades Association field representative and are provided with manuals which supplement the text material which the association has prepared for distribution to foremen attending conference programs.

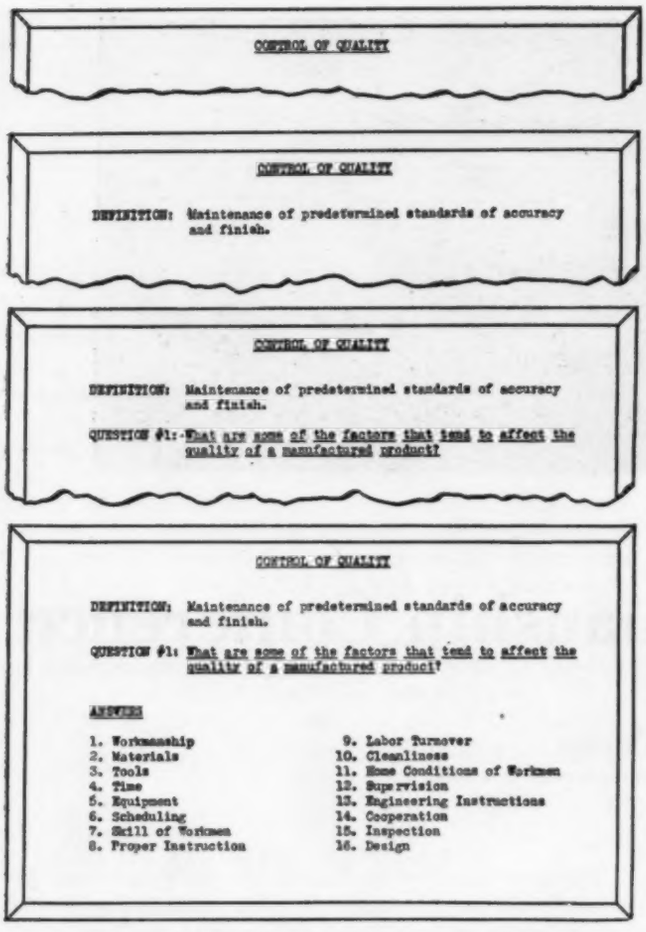
Foremen enrolled in conference programs are furnished with the text material, which is made up in individual units, at least one week prior to the time of the conference. These units are brief and concise and only a few minutes are required to read and study them prior to the conference. The foremen are not required to prepare any written work at any time and they are not given any special examination.

At time of the conference, the conference leader usually opens the session by writing the subject to be discussed at the top of the blackboard and by making a few brief remarks which are intended to introduce the subject and clearly indicate to all foremen in the conference just what is to be discussed. This procedure clears up any misinterpretation of the subject that may have been made by one or more of the conference group.

After concluding his introductory remarks the leader's next step is to aid the group in arriving at a logical, clean-cut definition of the subject to be discussed. This is an additional precaution taken to clear up any mistaken ideas that the group members may have formed and also to present new ideas to them.

When a satisfactory composite definition has been arrived at by combining the best suggestions made by the various group members, it is written on the blackboard directly under the subject. The conference has, at this time, progressed to the point where discussional questions should be presented for analysis and discussion. Discussional questions are planned and presented in logical sequence so that a thorough discussion of the entire subject is assured. They are written on the blackboard one at a time, directly below the definition. Discussional questions, if they are good ones, will draw from ten to fifty answers or ideas from the group members that the majority of them will agree are correct. Answers or ideas approved of by the majority of the members

NOTE: The definitions and questions used in illustrating this article are taken from the National Metal Trades Association Foremenship Conference Leader's Manual and are reproduced by permission of the copyright owners.


CONTROL OF QUALITY
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DEFINITION: Maintenance of predetermined standards of accuracy and finish.
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QUESTION #1:-What are some of the factors that tend to affect the quality of a manufactured product?
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ANSWERS
1. Workmanship
2. Materials
3. Tools
4. Time
5. Equipment
6. Scheduling
7. Skill of Workmen
8. Proper Instruction
9. Labor Turnover
10. Cleanliness
11. Home Conditions of Workmen
12. Supervision
13. Engineering Instructions
14. Cooperation
15. Inspection
16. Design

Progressive steps in the development of the discussion as written on the blackboard. This method relieves the mind from the burden of carrying the different factors and leaves it free for creative thinking

of a conference group are recorded on the blackboard, by the conference leader, directly under the question being discussed.

When the question has been discussed until all ideas or suggestions of any value have been drawn out, the blackboard is cleared and the next question is presented and the procedure repeated.

After all the questions prepared on the subject have been exhaustively discussed the conference leader usually summarizes the entire subject and assists the group to arrive at some definite, logical conclusions. The blackboard proceedings are recorded by a clerk and later duplicated and each member of the conference group is supplied with a copy. Important ideas and suggestions developed during a conference are referred to the proper company official.

The following subjects indicate the scope of those discussed:

Analyzing the Job	Routing
Maintaining Discipline	Control of Quality
Plant Organization	Cost Accounting
Materials and supplies	Labor Turnover
Wage Payment Policies	Health and Sanitation

Conferences are limited to one hour by most successful conference leaders, and unfinished subjects are carried over to the next regular session. Fifty-two subjects are included in the full course, which requires from two and a half to three years.

NEW BOOKS

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MECHANICAL WORLD ELECTRICAL POCKET BOOK FOR 1931.—*332 pages, 4x6 in. Cloth board covers. Illustrated. Published by Emmott & Co., Ltd., 65 King St., Manchester, England. Price 1s. 6d. net.*

One of the small pocket books and diaries published in England at a low price, this being the 24th year of this particular book. It is entirely devoted to electrical subjects and includes lighting, power, traction, instruments and all that goes to make up the various phases of electrical engineering. It is well printed and has small but legible illustrations.

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HIGH SPEED STEEL.—*By Marcus A. Grossman and Edgar C. Bain. 178 pages 6x9 in. Illustrated and Indexed. Cloth board covers. Published by John Wiley & Sons, 440 Fourth Ave., New York, N. Y. Price $3.50.*

This volume explains the manufacture of high speed steel from its melting in the crucible or electric furnace to the grinding which fashions the completed tool. The difficulties of handling this material in the ingot and during the cogging processes are described. Common faults in structure are pointed out with methods for detecting and avoiding them. Heat treating equipment and practice as applicable to high speed steel are given due attention.

The closing chapters are given over to metallurgical discussion covering the influence of each of the alloying elements. The text is well illustrated with photomicrographs and diagrams showing the properties and composition of high speed steel. While adding little new to the subject, the volume presents a summary of present-day practice for this material.

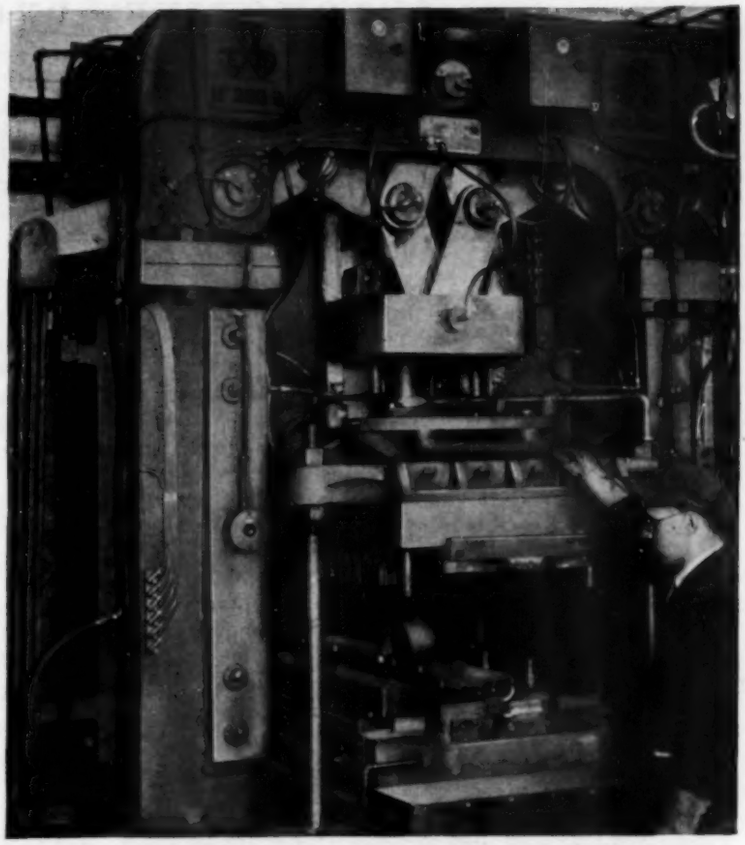
•

DIE DESIGN AND DIEMAKING PRACTICE.—*Edited by Franklin D. Jones, associate editor of "Machinery." First edition. 921 pages, 6x9 in. Imitation leather covers. Profusely illustrated. Published by the Industrial Press, 140–148 Lafayette St., New York, N. Y. Price, $6.00.*

This comprehensive volume of die design is largely recruited from articles that have appeared in the columns of "Machinery." The different designs, therefore, represent the combined knowledge and ideas of many people, reinforced by that of the editor, instead of the necessarily attenuated experiences of a single person.

The book starts off with common blanking dies, describes general diemaking practice, lubricants, tempering, etc. It contains an exceptional amount of information on deep-drawing dies and methods, and includes a large amount of data on finding blank sizes for shells. Considerable space is also given to special operations such as swaging and press assembly work.

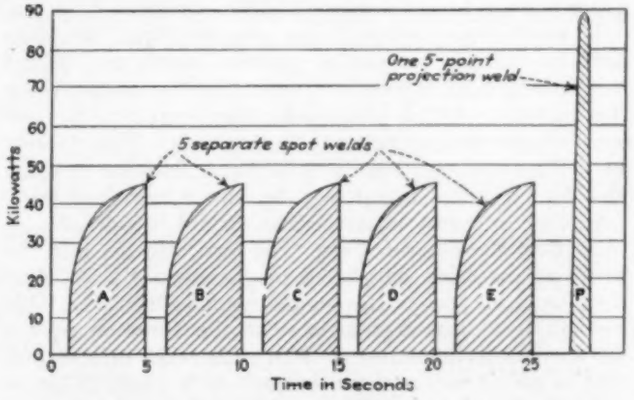
AUTOMOTIVE WELDING ADVANCES



Flash welding the upper to the lower half of the Oakland axle housing. Four 20-in. welds are made simultaneously in this huge Metropolitan welding machine

ADVANCES made in welding practice within recent years are rapidly putting a new complexion upon many production processes, as recent articles in *American Machinist* outlining the practices followed in Ford plants and others, indicate. One shop alone has built for other units in the same organization during the past year about a million and a half dollars worth of machines for automatic or semi-automatic welding on a large scale. Many of these machines are for so-called "relief" or "projection" welding which has largely displaced spot welding in some classes of work, and is deserving of wider application for several reasons outlined below.

Although projection welds in reality are spot welds, the machines used differ in certain respects and the welds are made several at a time, rather than singly in series, with a consequent and very material saving in time. During forming or blanking operations the projections or tits are stamped into one of the two pieces to be assembled in the projection welding operation, without adding any extra operation or increasing cost, except, perhaps, for a slight increase in forming die cost and upkeep. The projections carry all the current during the first part of the operation, hence they become heated rapidly. The mating piece rests against a smooth, usually a flat surface of the die, which is made, as a rule, from Elkonite or some other material which is not adversely affected by the high temperature or deformed by the heavy pressure imposed. As a result, the surface of the piece in contact with this half of the die remains smooth and the weld is almost invisible; consequently no grinding is required to remove blemishes, such as are common in ordinary spot welding. Since the die surfaces are not restricted, as in the spot welding, but are of many times greater area, wear and burning are negligible, and the dies last almost indefinitely.



Wattmeter chart showing the comparative power consumption in making five separate spot welds as compared to one five-point projection weld

Welds made by the projection method are also exceptionally uniform and reliable. The concentration of pressure insures such intimate contacts that scale, dirt or oil on the surface has practically no effect. For this reason, no special cleaning is required, and in some cases a single-pass sheet can be used satisfactorily in place of one that has been cold-rolled to give it a superior finish. Thick and thin sheets are readily welded, and sheet stock can be welded to forgings or to pieces of relatively heavy rolled section.

Of great importance is the fact that, after the machine is once set correctly, the operation is automatic and consequently the human element is eliminated. This accounts in part for the uniformity in the results secured.

Although at first thought projection welding might be expected to involve greater power consumption, careful tests show that the power consumed is materially less than for the same job with individual spot welds, as the

accompanying diagram indicates. 90 kilowatts maximum are drawn momentarily for the five-spot projection weld involved in this test, but the welds are completed in one second, the area P being the measure of the power used. In making five equivalent spot welds successively the maximum kilowatts drawn are 45, but the time is four seconds each. Hence the power consumption, as measured by the areas A, B, C, D and E, which total about ten times the area P, is much greater. The power consumed in making the five projection welds is about one-tenth of the total consumed in making five separate spot welds.

With all these advantages in their favor, it is not surprising that projection welders have displaced nearly all the spot welders in the automobile body building plants of one of the largest body manufacturers, where one projection welder does double the work of the spot welders formerly used, and only half as many operators are required. On a production of 20,000 body pillars a day the saving approximates $2,000 daily.

Turning to another type of welding, the practice followed in fabricating Oakland rear axle housings, as compared to that used by Ford is worthy of notice, even though the designs of the axles differ radically. The Ford passenger car axle (as explained in *American*

Ten-joint projection weld of a bracket to the under side of a fender. The welds are almost invisible on the top face of the fender

Machinist, Vol. 73, No. 15) consists of a differential housing, comprising a rolled channel section welded at two points to the forging, which bolts to the torque tube; and two axle housings rolled up, arc welded at the longitudinal seam, and flash-resistance welded to a forged bell at one end and to a hub forging at the other. A total of eight pieces and eight welds, each made separately, are required, not including the spring perches and their welding.

As compared to this, the Oakland axle, which is of the "banjo" type, so called, is made up from two heavy stampings, forming the upper and lower halves of the combined differential and axle housings, fused together in a single operation which flash welds the four 20-in. longitudinal seams simultaneously in a huge machine patented and designed especially for this purpose by the Metropolitan Engineering Corporation. Thereafter a hub forging is welded to each end of the completed housing. Thus, the axle fabrication is completed from four pieces and involves six welds, four of which are made in one operation. Two additional parts bolted to the front and rear sides of the central portion are required, however, to complete the differential enclosure.

A superficial view indicates that the Oakland axle is the simpler and perhaps the cheaper structure (due allowance being made for the larger size of car for which it is intended) but without comparative figures on all items the relative cost of manufacture can only be conjectured. As a production proposition it should be noted, however, that, although the Ford axle housing involves more parts and more separate welds, its parts are smaller and consequently are handled in smaller machines. Also, the stampings involve almost no scrap, whereas those used in the Oakland axle presumably are less economical in this respect.

However this may be, both axles are remarkable examples of what can be done in modern welding practice. They should serve to warn all executives of metal-working shops that welding machines are certain to play an extremely important part in future production work.

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Cataloging Useful Kinks

By Charles R. Whitehouse
Chief Time Study, Holtzer-Cabot Electric Company

THE LITTLE KINKS that we read about and see, often become useful to us at a later date, but when needed most, we cannot for the life of us remember them. It is impossible to carry all this knowledge in one's head, so why not devise a simple system whereby it can be found when needed? It is not my intention to try to devise a method of doing this, but merely to mention some of the methods I have seen in operation.

In one shop I visited, an office man was delegated to this task, and this is the method he used. Small boxes were put up in the various departments of the shop, with notices attached to them asking that the men in the shop, at any time when they read of or knew of any ideas or kinks that were likely to be of use to the shop, write them on paper provided for this purpose. These ideas were collected, and the accepted ones were paid for at the rate of one dollar each. This is an inexpensive way of buying knowledge. The office end of the job requires very little time. The accepted ideas were filed under suitable headings. Anything on welding went into folder "W," on milling, into folder "M," and so on. This file was open at all times, and often, when a foreman had been stumped on an odd job, it was but the work of a few minutes to find a way out of his particular dilemma.

In another shop where I was once employed, the foremen cut out any interesting printed matter and pasted it into loose-leaf notebooks supplied by the company for this purpose. Other ideas picked up from time to time were typewritten on paper to fit the book. This method has advantages over the other in that it does not cost the employer so much, and it soon becomes a matter of pride with each foreman to have more useful information at hand than the other fellow. The men also get into the spirit of the thing and bring the foreman all the ideas they can, to add to the department's "Bible." This method is also reciprocal in that the foreman of the different departments swap with each other information that is of no use to them, but which is likely to prove valuable to another. This method takes but little time and is a money-saver. I have done this myself for some years, and I should hate to lose my little book.

Fixture Movements Accomplished Hydraulically

Further use has been made of the Oilgear system to index and clamp rotating fixtures on milling machines

SPECTACLES were developed in China some 2,000 years before the principles of optics were known, but the Chinese used their spectacles merely to indicate official position, possessions, or knowledge. The principles of hydraulics might almost be considered in the same category, for it is only now, after some 2,000 years, that these age-old principles are being applied successfully to machine tools.

Pneumatic clamping fixtures have been widely applied on milling machines in the last few years. Some of their newer applications are pointed out in an article by Frank W. Curtis on page 270, Vol. 73, of *American Machinist*. But these clamping devices require an air supply, and with hydraulic pressure available in the table feed on a milling machine, why not adapt it to the clamping and indexing operations? This feed, if applied, offers a completely automatic and self-contained cycle, with no exterior piping, flexible joints, or leaky supply lines. Oil under pressure can be taken directly from the Oilgear unit without disturbing its original function as a feed-actuating device.

By using an indexing type of fixture, the operator can load one station while the other is in the cut. Hydraulic power for indexing saves him the effort of this work, which may be quite fatiguing if the table and work are heavy or if the moving parts tend to bind owing to the small clearances necessary for rigidity during the cut. Tying in the index cycle with the machine cycle results in accurate synchronization and no loss of time. Having only to load and clamp the work, the operator is left free to perform this function without first having to rotate and lock what may be a sluggish table.

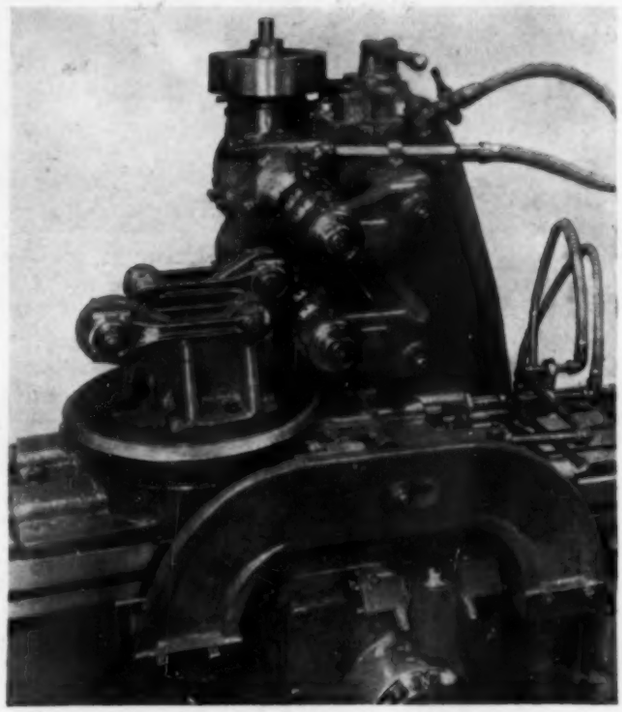


Fig. 1—Loading is the operator's only function. Hydraulic pistons index the table 180 deg. at the end of the cycle

In the examples to be described, clamping of the work itself is so simple that plain mechanical devices, such as washers and nuts, or capstan wheels, suffice. It would be possible, however, to carry the idea further and apply hydraulic power to work-clamping devices also, but this might result in a fixture cost that would be unwarranted. Obviously, hydraulically actuated fixtures are most feasible for high-production work on a single piece where no radical changes in part design are expected for some time. Specific examples are taken from automotive practice—aeronautic engine parts—but may be applied to any mass-production work. The units involved are "Rigidmils" made by the Sunstrand Machine Tool Company, which also designed and built the fixtures.

One of the first types of such fixtures to be built was designed to hold a pair of connecting rods while the bolt bosses are form milled on each side with a pair of cutters on duplex arbors. In this fixture, shown in Fig. 1, indexing of the rotary table is

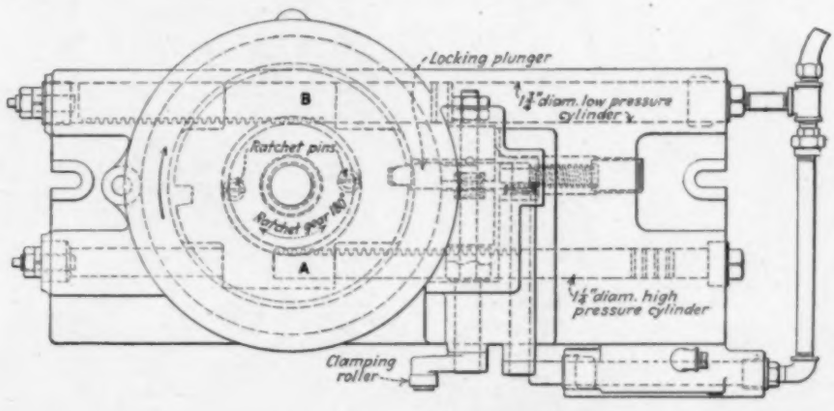


Fig. 2—Rack *B* with constant low pressure on its piston returns the ratchet gear to its original position when high pressure on rack *A* is released

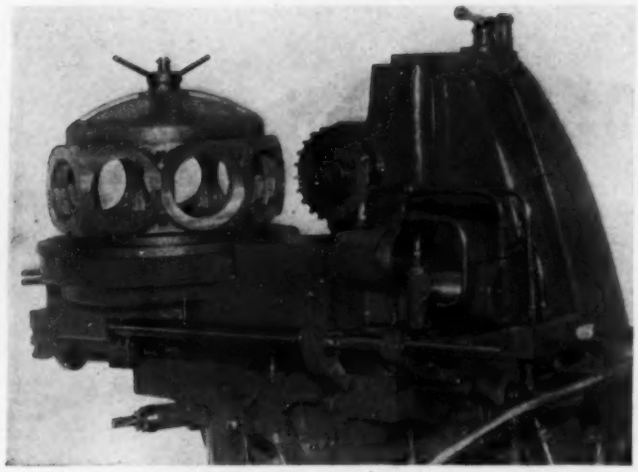


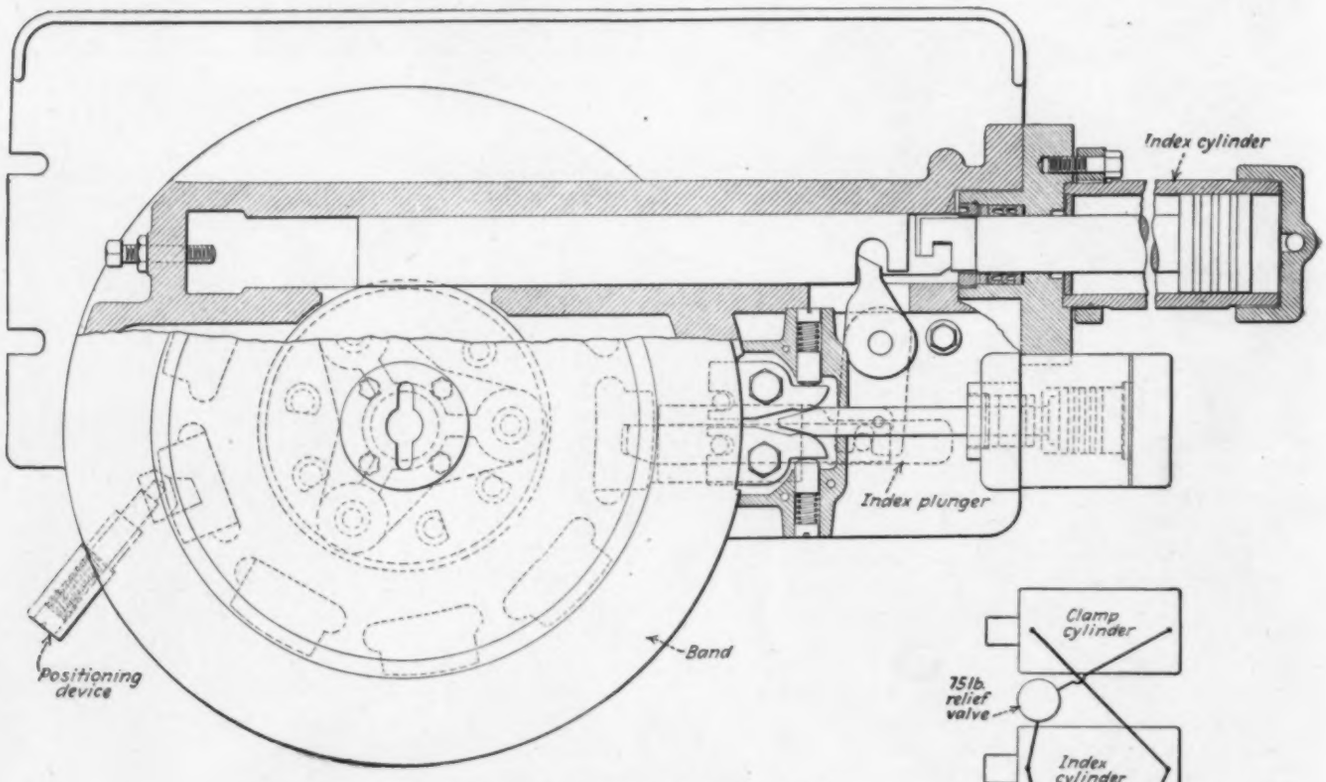
Fig. 3—Indexing and clamping automatically, nine times each cycle, are accomplished by two hydraulic cylinders shown at the end of the table

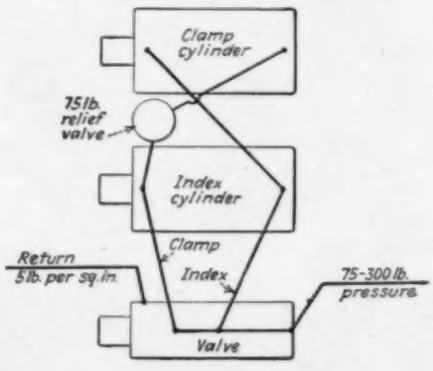
performed hydraulically, and clamping is done mechanically. In another type to be illustrated, both indexing and clamping of the table are accomplished by hydraulic means.

Details of the fixture design are shown in Fig. 2. Essentially, the device consists of a circular table capable of being indexed 180 deg. at a time through ratchet pins on a gear driven by two racks, contacting at opposite points. Rack *A* is connected to the high-pressure line and is the one that indexes the table; rack *B* is connected to the low-pressure line and serves to return the gear and the first rack to their original positions. Both racks are cut integral with the hydraulic rams that actuate them. Clamping of the table is by two semi-circular bands of V-section that restrain the table circumferentially and also bind it to the fixture base in a vertical direction. Pivoted at one end, the two halves are brought toward each other by cam action during the longitudinal movement of the machine table.

The low-pressure cyclinder, which is continuously connected to the low-pressure line at 75 lb. per sq.in. is $1\frac{1}{4}$ in. in diam., and serves as a spring return. A control valve on the side of the fixture regulates the admission and discharge of oil at 1,000 lb. per sq.in. to the high-pressure cylinder, which is $1\frac{1}{4}$ in. in diam. From the end of this valve extends a simple plunger that contacts with a screw-adjusted stop on a special control bracket bolted to the front of the machine. Also carried on this bracket are a cam plate for the table clamping lever and an adjustable dog for operating a release lever for the index plunger.

This index plunger is backed by a helical spring and is cammed out of its locked position during the last $\frac{7}{8}$ in. of travel of the machine table to its returned position. At the same part of the cycle, the clamp bands, ordinarily held in locked position, are released through cam action on the trip lever with its roller follower. Upon the return of the table, by means of the same lever, clamping takes place through interlocking serrations on facing disks. Once turned until the high points meet, the device is self-locking. When the trip lever rotates one





[Above] Fig. 4—A single rack and low-pressure piston indexes the table through a ratchet gear. The small piston actuates the clamping device [Right] Fig. 5—Diagrammatic scheme of piping for full hydraulic fixture control

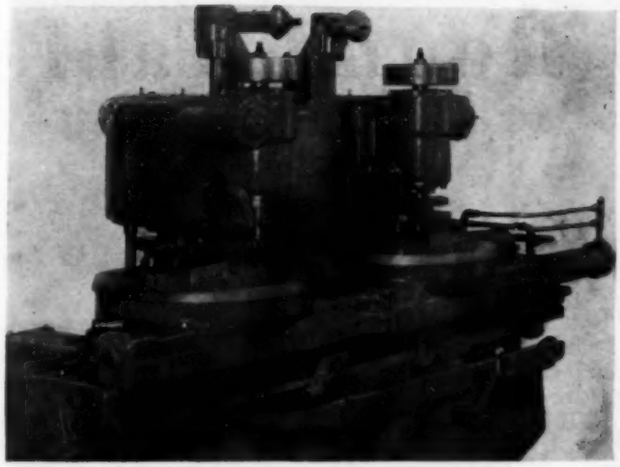


Fig. 6—Both tables are indexed simultaneously by racks in tandem actuated by a single piston. Clamping is done by independent pistons

disk until the low points meet, a helical spring releases the clamp bands.

With this arrangement, the cycle is as follows: rapid advance, feed, and rapid reverse, release table clamp, release index plunger lock, index table, lock and clamp, ready for rapid advance once more. As soon as the drive rack hits a dead stop, the pressure builds up in the table feed circuit, in which the index rack plunger is connected in parallel, and the longitudinal table begins to rapid approach. At the same time the rotary table is locked and the index pin dropped in place. As soon as the machine table starts back toward the cutters, the control valve is tripped by a dog, thus releasing pressure on the driving plunger, which is returned, through the action of the ratchet gear, by the constant pressure on the low-pressure rack. Oil behind the piston is discharged back into the system through a port which is opened by the same operating valve.

Approach is 2⅞ in. at 180 in. per min.; feed, 3⅛ in. at 9½ in. per min., with rapid return of 6 in. Two connecting rods are finished at each cycle.

Carrying the idea further and simplifying it, the company built some fixtures in which not only is table indexing done hydraulically, but also the table clamping and locking, without reliance upon cam action. Fig. 3 shows a hydraulic fixture on a Rigidmil in which nine faces are being milled on an aluminum crankcase of a radial airplane engine. Between each cutting operataion the table is indexed automatically to the next position, until all faces have been milled, at which point the table is stopped automatically. In this view the upper cylinder actuates the clamping mechanism, and the lower one, the indexing device through a rack and gear as before. Through a valve shown below and to the right of this cylinder, oil can be admitted to either side of the two pistons so that they are double acting. Upon reversal of oil pressure, the rack returns to its initial position, and ratchet pins allow the gears to reverse while the fixture table is held stationary by an index pin.

Further details are shown in the cross-sectional view, Fig. 5, in which the piston, cylinder, and packing construction is evident. For convenience in assembly, the rack bar is separate from the piston rod and is connected by a simple overlap joint. Immediately to the left of this connection may be seen a notch in the rack in which the end of a pivoted arm bears. During the first 1¼ in. of travel of the rack, and before the pair of gear pawls pick up the table, this lever mechanism releases the index plunger, a slot in the lever engaging a pin in the plunger. Upon the return of the piston, the link is in the position shown, and since full working pressure is allowed to remain on the back side of the piston, its reaction comes on this link, thus positively holding the index pin during the cutting cycle.

Independent control of the band V-clamp is by its own hydraulic cylinder and piston operating a wedge. This wedge is applied between two pivoted links with cam ends that pull the clamp halves together through slots engaging pins. Spring-backed plungers return the links to their original position when the wedge is withdrawn. During the cut, working pressure is held against the piston and wedge, assuring positive clamping in addition to locking by the index pin. A spring-actuated positioning plunger on the other side of the table assures proper registry of the lock pin with the nine indexing notches on the table.

Referring to the piping diagram, Fig. 5, we find that when the longitudinal table travel actuates the valve plunger, oil under pressure is admitted to the front side of the indexing piston and on the back side of the clamping piston. Simultaneously, the clamp is released and the index rack moves forward, pulling out the index lock pin as it goes. Further longitudinal movement of the machine table exposes another part in the valve and admits oil to the back side of the index piston, which is reversed and held under pressure during the cut. As soon as this piston has been stopped by the lock pin link, as previously described, pressure immediately builds up on a relief valve, and when it reaches 75 lb. per sq.in., oil passes to the clamp cylinder on the front of the piston. Clamping then takes place, and the pressure remains in the system until the valve is actuated again upon the return of the table.

With the clamp mechanism shown, the table is not only restrained radially, but also is clamped vertically to the fixture base by the action of the V-halves. In order to break the oil seal thus created, a helical spring is placed in the hollow center column of the cylinder, and it tends to lift the table slightly when the clamping pressure is released.

Still another application of the full hydraulic system is shown in Fig. 7. Here a single index cylinder actuates two tables simultaneously through a pair of racks in tandem, but each table is clamped separately with hydraulic means.

Fixtures such as these receive as much detail attention as do the machines themselves. As such they characterize the present trend in machine tool design and application, namely, the use of standard machine units with, in many instances, elaborate and expensive tooling to adapt the unit to some special operation, made as fully automatic as possible.

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Before nitriding, any parts previously heat-treated must be re-drawn and 0.020 to 0.030 in. of the surfaces ground or machined off.

In nitriding, the growth of the part may be predetermined accurately, normal growth on a 1-in. cylinder being 0.001 in. in 90 hours. There is practically no distortion.

The Foreman's Round Table

GILDING THE LILY

"HELLO, Operator. I asked for Ed Graham's department, and you gave me the scrap yard. Guess again, please. . . . Hello, Ed, that you? Say, come 'round to my department this noon and tell your men to come; they'll see something worthwhile."

"What do you call worthwhile? Are you staging a bathing beauty contest or a style show?"

"Nothing like that or I wouldn't invite you."

"Well, then, I suppose you are going to show us how to make a hacksaw do the work of a planer."

"Nope, sorry to disappoint you, Ed. All I have is a demonstrator with a kit of tools —the finest you ever saw."

"That lets me out, Al. I don't need any tools."

"Maybe you don't, but some of your men might be interested."

"Not from my telling them, they won't."

"You can't afford to put yourself on record as being opposed to your men having tools, can you, Ed?"

"I don't give a rap whether I can afford it or not. I am."

"Don't be foolish; a mechanic is known by his tools, and the foreman by his mechanics."

"Yes, and don't forget that a good mechanic can work without tools. That's the kind I want."

"Well, when a man don't like a dog he's either been bit or he has an ingrowing disposition. Which it is, Ed?"

"I've been bit, and if a feller gets bit twice, it's his own fault."

"How come?"

"Last summer, when we were having all that hullabaloo about quality, I let one of them bozos into my department one noon. He had an outfit of tools that would put your eye out."

"And nobody bought, hey?"

"Wrong! Everybody bought, that's the hell of it."

"What's wrong about that, were the tools no good?"

"The tools were all right, but the man that bought an inside mike insisted on measuring each piece he made a half dozen times, and I near had to fire another man to get him to use a pair of calipers instead of an outside mike on a roughing job."

"But that was an extreme case, Ed. It probably wouldn't happen again."

"Extreme or not, it was enough. Joe Brown, one of my apprentices, invested his month's pay in mikes. With half the money he could have bought a good supply of calipers and other tools that he could use to better advantage. Other men discarded their scales, height gages went into the discard, and men were measuring turned washers with a vernier—everybody had one. I sure had to ride that bunch to get any work."

"I'll take care of that, Ed."

"Yes you will, and how? A mechanic around tools is as crazy as a woman in a——"

"Hello, operator, you cut me off."

Is there a disadvantage in too many tools?
It is wise to encourage men to buy?

Suggested by R. H. Kasper

▸ ▸ ▸ Discussion of Former Topics

The Stork's Assistant

From the employer's viewpoint, physical examinations at frequent intervals are of value in weeding out undesirable risks, and in this he is entirely within his rights.

This is frequently to the worker's interest also in case of compensation arguments, as it establishes records of his health at intervals which can be checked back to indicate at least that his disability occurred or progressed during certain periods.

These records also serve to show undesirable conditions existing in some cases which are conducive to the so-called occupational diseases, and which may be remedied as the result of persistent bad records of departments.

To have one's own physician make examinations is not only unjust to employees, but does not prove much to the employer to whom the examination is of primary importance. —JOHN S. ISDALE, *Plant Engineer, International Silver Company.*

Mechanized

One can quite understand people being opposed to machinery when their livelihood is taken away by the introduction of mechanical operations, but the machinist, who stands to gain and not to lose, should be the last to complain.

How would the mechanic feel if he could be suddenly transplanted back to the non-mechanical age? He would be "mighty sore" at having to labor at non-mechanical work with hand-made tools. Imagine him coming home at night to a mud hut, and his wife cooking over a wood fire built on the ground. Think how he would miss the gas stove, matches, electric light, domestic utensils, articles from the 5 & 10c. store, the radio, automobile, trolley, bus, and train.

Possibly some may say that machinery is all right up to a point, but today there is over-production. I venture to say that at present we are a long way from over-production, but there is under-consumption. Not until every one has the use of an automobile, radio, electrical and mechanical appliances in the home, can we even begin to think of over-production.

—ALFRED C. LAYZELL.

Trying His Wings

Concerning the matter of advising a man as to whether or not he should go into business for himself, I do not think the average shop executive is qualified to give advice. His training has been along lines of production and leadership. How much does the "boss" know about the economic conditions of the business that his employee is considering? Unless he is entirely familiar with these conditions, nobody has any moral right to advise a man in the fields which they control. The legal phases of a small business are also matters with which the adviser should be thoroughly conversant. Finally, the question of whether or not the employee is psychologically fit to run his own business comes up.

It is easy to see that the chance of any shop man having all the above knowledge is very small. Even if a foreman or superintendent had all this information at his fingertips it would still be dangerous to give advice. If anything goes wrong in the business venture, regardless of where the fault lies, the adviser loses prestige with the men who are working under him. Therefore, the only conclusion that I can draw is that it is neither logical nor ethical to give an employee advice on important matters other than the firm's business.

—W. G. BARTOLOMAY, II.

Whistlin' Willie

While noise has generally been accepted as incidental to machine shop routine, a great deal of it is without doubt preventable, and, with the introduction of motor driven machine tools, such annoyances as shrieking planer drives, etc., are being eliminated.

This, I am convinced, is bound to lessen nerve fatigue, which is often a contributory factor in causing accidents.

To achieve that cloistered calm which is supposed to prevail in the office of the high-powered executive is out of the question where the machine shop is concerned. Yet, while the average workman becomes inured to noise, he is quick to resent noise that savors of the unnecessary, and the foreman is seldom required to suppress a nuisance of the Phillip's type.

To sum up, the man who, within limits, sings or whistles at work, is generally of a contented disposition and, while not of a concentrative type of mind, is generally an efficient worker. So long as he does not distract his more conservative brother no attempt at noise abatement is justified in his particular case.

In general, however, research in this field has much to recommend it. —ROBERT S. ALEXANDER, *Universal Winding Company.*

The Tower of Babble

While the very plan upon which our country is built demands that the employees of our industries be largely either foreign-born or the descendants of foreign-born races, this same plan provides that all dwellers within the country, if they are other than casual visitors, will become citizens and thus a definite part of the population and body politic.

It naturally follows, therefore, that whatever may be the racial prejudices of any individual, derived from his training or environment prior to coming to the United

States, these prejudices must be submerged in a general program of becoming a citizen of this country. To delay such submergence or to attempt to retain such prejudices merely means that the individual at heart has no desire to become a citizen.

Similarly, when it comes to employment within the corporation boundaries of an industrial organization, it is a practical impossibility to attempt to segregate or set up positions of opposed interests, whether they be based on racial characteristics, selfish personal desires or political affiliations, and expect that the utmost success can come to the industry as a business venture.

Any attempt at segregation of races within an industrial organization, while in isolated cases it may seem to be a local solution to some trouble-provoking problem, cannot be considered as anything other than an un-American method of fostering the very things which go to make discord, lack of co-ordination, and prejudice. As such, it cannot help but be not only unprogressive from a moral standpoint, but it will prove decidedly unprofitable in the long run. —D. C. WRIGHT.

In a shop or mill that has been running over one generation there are usually several reliable foreign-born employees. The oldest employee of each nationality is generally looked to by new arrivals of his race for guidance. These various leaders, due to the fact that at the beginning they were placed together in one group as green help, aid materially in breaking down racial barriers.

Industrial conditions govern the method of handling this racial problem. During dull times all races can be mixed together with little surface friction. In prosperous times it is not advisable to do this.

Back early in the war when help was scarce and touchy, we had Russian, Austrian and German Poles, Hungarians, Bohemians, Finns, Russians, Italians, Danes, and men of one or two other nationalities many of whom could speak no English. Our method had been to put the new arrivals in his racial leader's group for a few weeks and then take the best trained from several new groups and organize a mixed group. This gave the leaders a chance to observe and report on the probable usefulness of each of his compatriots with other groups.

It finally worked out that we had about seventy per cent of the groups mixed, and the tempermental fire-eaters were segregated, each nationality having its group. While by doing this we could not control feelings outside of the plant, we had little war trouble with the employees and secured the desired production from each individual group. —E. E. GAGNON, *Mechanical Superintendent, Raybestos-Manhattan, Inc.*

No Exceptions

When a blanket order barring all pay increases has been issued, the promise route is the one way out for the foreman, and this executive should be very chary of his promises, for he himself may wake up some morning feeling grieved about not having received an increase when in his mind it was due him.

Executives are very human when it comes to their pay checks, just the same as the workman, and they also hunt a new job when they feel they can do better elsewhere.

Really valuable men cannot be saved under a blanket order. Their services may be extended a few months by the promise of better pay later on, but in case the promised pay does not come later, the firm loses its valuable men.

—C. F. STAPLES.

The Cost of Quality

The only place where perfect work is justified is in research or in the laboratory. It must be perfect in every respect if used in these departments because it becomes a kind of tool to prove or disprove certain discoveries or developments. Perfect work requires more time, means low rate of production, extra checking and no scrap; costs much more. Speeding up production cuts the time element considerably, allows less checking, lowers costs, and necessarily makes a little scrap as a result of the faster work. The work is not as perfect but if it will function properly no ill effects will ensue. Extra quality work is all right as an ornament or as a work of art. But when considered in the light of utility the cost will be found to be much higher than warranted by the conditions under which it will be used.

—L. O. BROWN.

Something for Nothing

In view of the fact that good men are hard to get when business is good it would seem a wise policy to hold onto all the good men possible until business does pick up.

After all, is it not a fact that the employee is not responsible for the amount of business his company does? Is it not rather the responsibility of the shop manager, who says whether the shop goes on short time or whether some of the less desirable help are dispensed with?

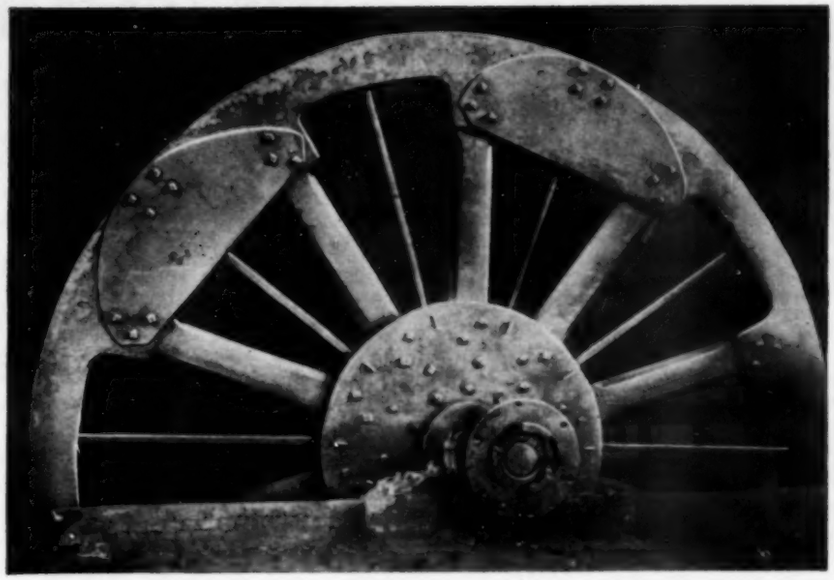
I hold that hard times are the result of a boom in industry. The public wants something. Just as soon as manufacturers get wise to what the public wants, there is a wholesale drafting of men and materials for that particular business, so that by the time the public has been satiated, so to speak, there are millions of dollars invested on which stockholders expect to get their dividends.

Take radios for instance. There is hardly a family able to afford a radio that has not already had three or four, and if a man but breathes the word that his present set is not working just right, the very next day his wife will receive summons to the door, and if it is not a college student selling magazines, it will be a man with a new radio.

If half the concentration put into one product were diverted to other ventures the first step towards stabilization would have been taken.

The rule in farming should hold true in business. To be sure there are thousands of dollars made on growing wheat alone, but there are also thousands lost. Diversification is the answer.

In conclusion, I would like to tell Al that one man today can, in almost any line of manufacturing, turn out more and better work in six hours than was done when his father had to work ten or even thirteen hours, and Al knows it. High line-belt speeds and short hours go hand in hand. —RALPH M. GAMBLE.



Photographs courtesy Lukenweld, Inc.

Fig. 1—Wood flywheel used a hundred years ago in the old Brandywine Rolling Mill at Coatesville, Pa.

CAST vs. WELDED FLYWHEELS

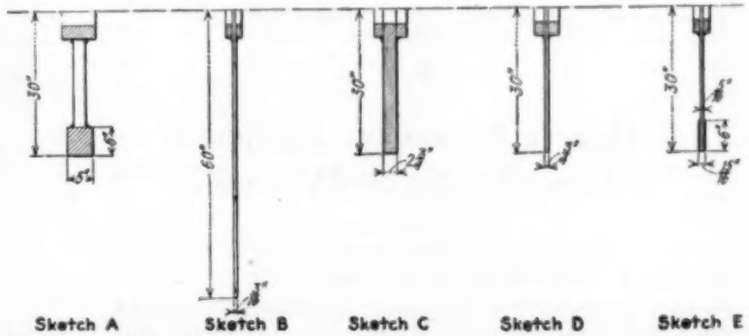
ROBERT E. KINKEAD
Consulting Engineer

A HUNDRED years ago in Eastern Pennsylvania it was less expensive to build flywheels of wood than it was to cast them in gray iron. An accompanying illustration shows a wood flywheel used in the old Brandywine Rolling Mill which was the predecessor of The Lukens Steel Company at Coatesville. It cost less to build the wheel of wood because there was plenty of wood at Coatesville. The cast wheel would have had to be made at Philadelphia and transported forty miles over mud roads by ox team.

At the present time the machine designer has the choice in some cases of using either cast iron, welded steel, or steel castings. This discussion will indicate some of the advantages and limitations of substituting welded steel for cast iron flywheels. A typical cast iron flywheel may be chosen for reference. Sketch *A* shows half of such a wheel with dimensions and the design data given. These complete the design specification, with the exception of the key shear, neglected in this discussion for the reason that it is a factor which does not materially affect the cost of the wheel. Steel being of at least four times as great strength as gray iron, a higher peripheral speed may be used. Sketch *B* shows what happens to the size of the wheel when the shaft R.P.M. is kept the same and double the peripheral speed is used in an effort to reduce the weight and cost of the wheel. The result is obviously impractical.

If the shaft on which the flywheel were to be mounted could not be speeded up and the diameter of the wheel could not be increased, the general design of wheel shown in Sketch *C* might be used. Considering that about 30 per cent of the material is wasted when a steel disk is cut out of a square slab, it would be expected that the steel disk wheel would not offer any large degree of economy. As a matter of fact, the cost of the steel wheel would be about 85 per cent of the cost of the cast iron wheel. Also, there would be no danger whatever of the steel wheel flying apart at any speed which a shaft normally operating at 336 R.P.M. would reach, a danger which has always influenced flywheel construction and use.

There might be cases in which the wheel could have a somewhat larger diameter, in which a modification



	Sketch A	Sketch B	Sketch C	Sketch D	Sketch E
Kinetic Energy, Ft. Lb.	131,000	131,000	131,000	131,000	131,000
Peripheral Speed, Ft. per Min.	5,280	10,560	5,280	10,560	10,560
Total Weight, Lb	1,700	620	2,200	560	450
R.p.m.	336	336	336	672	672

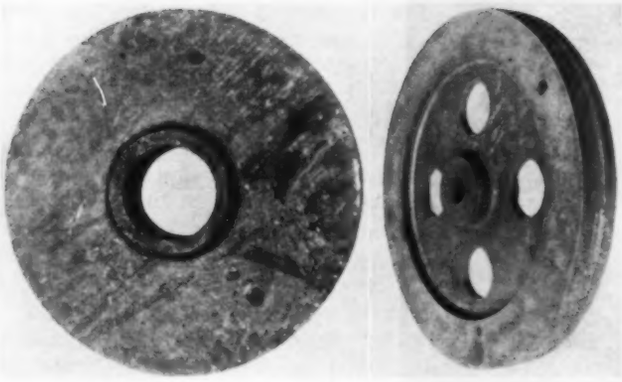


Fig. 2—Disk-type welded steel flywheel. Fig. 3—Built-up welded steel flywheel

of the design shown in Sketch *B* would be more economical.

The foregoing discussion leads to the presumption that steel may be substituted with large economies only in those cases in which the speed of the shaft can be increased so that the superior physical properties of steel may be used. Sketch *D* shows a design which gives the same energy storage at twice the peripheral speed. Where this increase in shaft speed is possible it is evident that economies are large. With a cost of 4c. per lb. for the cast iron, the welded steel wheel would show economies at 10c. per lb. As a matter of fact, the welded steel wheel could probably be bought for less than 7c. per lb. Fig. 2 shows one of these welded steel wheels. The cast iron wheel at 4c. per pound would cost $68. The equivalent steel wheel, run at double the speed, with the fabricated cost at 6c. per lb., would cost $32.40.

The machine designer will see at once that the solid disk wheel does not use material very efficiently. Sketch *E* and Fig. 3 show a modification. The additional waste, cutting, and welding bring the cost of this design up to nearly 10c. per lb. which would seem to indicate that the job might pass out of the economical range of welded steel and belong in the cast steel range.

From this discussion, the conclusion might be drawn that large economies may be expected from substituting welded steel for cast iron in flywheels in cases in which either the shaft speed can be increased, or the diameter of the wheel may be increased. But economies may only be made by use of the plain disk type of steel wheel. Where the diameter of the wheel and its speed cannot be changed, the economy may be of the order of 15 per cent, but a relatively small increase in diameter might introduce economies up to 30 or 40 per cent.

■

Is There a Market for Equipment of Lesser Quality?—*Discussion*

J. H. Slater
Vice-President and General Manager, Hydraulic Machinery Company, Ltd.

THE EDITORIAL in *American Machinist*, Vol. 73, p. 716, brings out a point well worth discussion. One reads much in trade journals of the scrap piles within the shop and the wisdom of replacing out-of-date machine tools. Outside of the rattling epicycloidal teeth in the back gears of the old David W. Pond lathe, is there one on the market today superior to it in simplicity of design and operating rigidity?

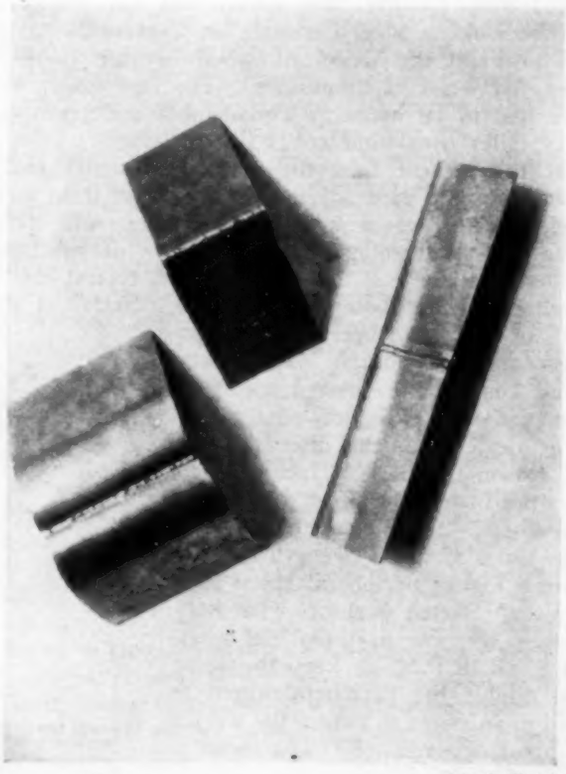
To cite some of the troubles with modern lathes would take up more space than we care to give. Suffice it to say that we would buy one of the old Pond lathes today in preference to any new lathe on the market and be satisfied that we would have less trouble with it.

Lathes only are mentioned here because more so-called improvements have been made on them than any other machine tool. Much can be said of changes on radial drills, planers, and shapers that are not improvements. It would be well if machine tool manufacturers took a step backward and again adopted some of the common-sense features of the old time machines.

■

Welds in Light-Gage Stock

INCREASING use of welding in the fabrication of steel plate has raised an occasional question regarding its applicability to light-gage stock. The accompanying photograph shows a corner weld in 18-gage material, hand arc-welded at a speed of 16 in. per min.; at a cost of but 2½c. per foot, taking into consideration the cost of labor, current, and material. Labor was here considered at $1 per hour, current at 2c. per kilowatt-hour, and electrode at 65c. per pound. A similar weld bent back upon itself, and another bent at right angles to the weld, show weld ductility. Oxy-acetylene welding may be applied to this class of work also, a light-weight blowpipe being used, with the jigs so designed as to carry away excess heat. Aircraft tubing comes within this general class of material.



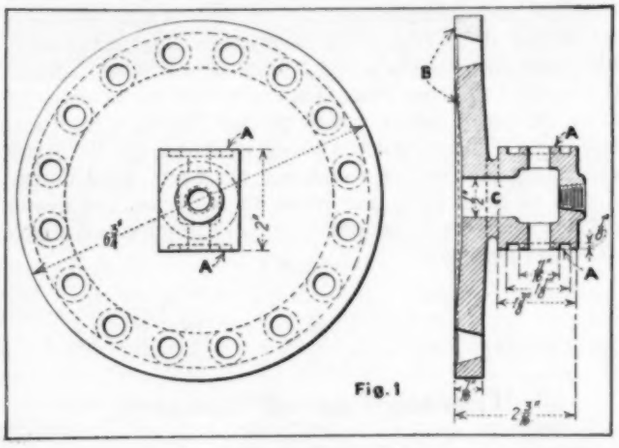
Lincoln Electric

IDEAS FROM PRACTICAL MEN

Tools for Facing and Grooving

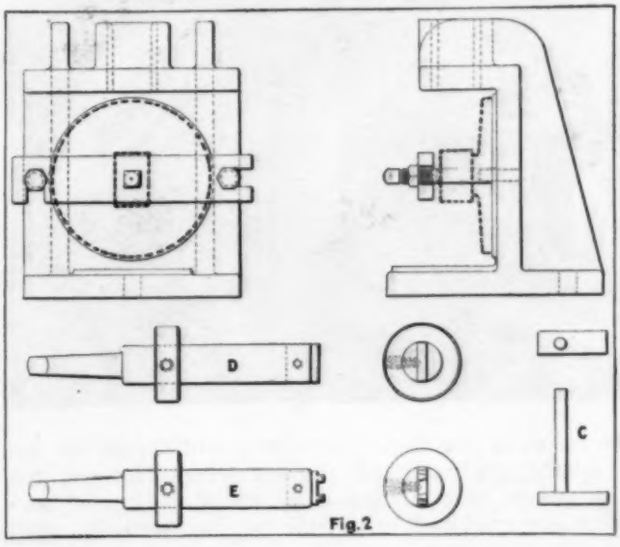
CHARLES C. TOMNEY
Tool Designer, Brunswick-Krocschell Company

AMONG other operations, the covers of our automatic expansion valves must have two sides of the rectangular bosses faced and grooved, as at *A*, Fig. 1. The previous operations consist of facing and beveling the surface *B* and drilling the ½-in. hole *C*, the hole being used for locating the work in the succeeding operation. It is necessary that the surfaces *A* be equidistant from the center line and parallel with each other within a few



thousandths of an inch. In Fig. 2 is shown the fixture and the tools for facing and grooving the boss.

The body of the fixture is of cast iron ribbed to prevent it from springing. The hardened and ground bushing at the top is extra long, so as to give adequate support to the facing and grooving tools, which extend about 3 in. below it. In operation, the work, shown in heavy dotted lines, is placed over the central stud and is clamped by a strap clamp. The rectangular boss is squared by the special square *C*, the stock of which is placed on the finished surface on the lower part of the fixture. The upper side of the boss is faced by the tool *D*, its cutting edge being kept the correct distance from the center line by a stop collar that contacts with the bushing boss. Removing the facing tool, the grooving tool *E* is then inserted through the bushing, and the groove is cut by the double-tooled cutter, also controlled by a stop collar.



To index the work for facing and grooving the opposite side of the boss, the clamp is slacked and the work is turned half-way round, the correct indexing being determined by setting a block between the finished surface at the lower part of the fixture and the surface of the boss just machined. Since the block is a slip fit between the surfaces, it automatically squares the work. While we know that the work could be done faster in a more elaborate fixture, the small amount of product would not warrant its extra cost.

Milling Ports in a Valve Bushing
Discussion

MAX SCHWAZE
Foreman, Milwaukee Shop, C. M. & St. P. Railroad

I HAVE felt somewhat reluctant to reply to J. T. Towlson's article on page 63, Vol. 73, of the *American Machinist*, in which he discusses my article under the title given above, on page 273, Vol. 72, of the same journal. However, as Mr. Towlson has put me in rather a false position, I feel that it is my duty to set myself straight before your readers.

In his discussion, Mr. Towlson states that I have ignored the value of the rotary table and have used the longitudinal feed. I feel that he is mistaken, since I know that the rotary table is most vital on this job, and was used by me in the set-up described. While the work was mounted on the rotary table, the hand feed of that table was used only to bring the port to be milled central with the cutters. The entire combination of tables was then moved toward the cutters, which brought the bushing within cutting range. The longitudinal feed was then engaged, plunging the work into the cutters. This cut gave a maximum opening on the inside of the bushing, and as the cutters protruded through the wall, all the metal was removed except the small corners, which are immaterial. The same procedure was gone through until all the ports had been milled.

Although the work referred to may be an every-day job, the fact remains that it can be done in different ways, and the man who has a progressive mind will endeavor to find some way of doing the work in another manner than the one his great grandfather handed down to him. While some of the older methods are very good,

we must remember that the present age will not stand for antediluvian methods in machine-shop practice.

The old way of milling the ports on a knee-type milling machine, using the rotary table for feeding the work to the cut, is not as practical as is the method described, inasmuch as it is necessary to use an end mill, and to cut the tops and bottoms of the ports separately. The end mill leaves fillets in the corners of the ports, cutting down the opening, which retards the exhaust and impairs the efficiency of the engine. With the milling cutters removing the metal from the inside of the bushing, thereby cutting clean into the corners, a better and more snappy action of the engine is produced. Also, with the two cutters cutting at the same time, there will be no variation in the width of the ports.

The older method has been entirely dispensed with in our shop in favor of the method outlined above, as being more accurate and efficient. Using an end mill and feeding to the cut by the rotary table, it took two and one-half hours to mill a bushing having eight ports. By the new method, the eight ports are milled in 25 min., floor to floor time.

I thoroughly appreciate Mr. Towlson's article and want to express my sincere appreciation to F. M. A'Hearn for his article on the same subject, on page 558, Vol. 73, of the *American Machinist*.

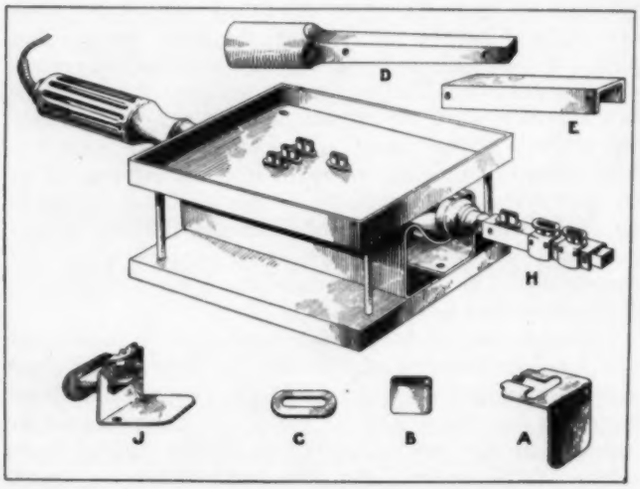
■

A Simple Method of Soldering Small Parts

CHARLES H. WILLEY
Superintendent of Manufacturing,
Hoyt Electrical Instrument Works

Sometimes very simple ideas result in a considerable saving in costs. Such ideas are nearly always conceived in an effort to make one's work easier, as was the case in the method here described.

In the assembly of our cheaper grade of voltmeters, we required a large quantity of combination movement-supports on which the pointers, pivots and armatures were mounted. Spools for the energizing coils were soldered to the backs of the supports. Securing the spools by any other method than soldering was not successful. We tried attaching them by ears bent over the supports. We also tried attaching them by screws, and even experimented in cementing them with Bakelite. One of the supports is shown at *A*, one of the spool bodies at *B*, and one of the flanges at *C*. The stock for the support and the flange is 1/32-in. soft brass, while the stock for the spool body is 0.010-in. semi-hard brass.



Soldering the spools to the supports was accomplished by the use of a large-sized electric soldering iron, the copper of which was removed and replaced by one that was flattened and dressed to the shape and size indicated at *D*. To this copper the aluminum channel *E*, $\frac{1}{8}$ in. thick, was attached by pins. The soldering iron was used only for heating the work to soldering temperature. The operation was greatly speeded by placing the work in an aluminum preheating tray mounted over the soldering iron and attached to a slate base. Asbestos was packed between the under part of the soldering iron and the slate base, so as to have most of the heat reach the tray.

The work was assembled by the use of assembling tools or fixtures, first assembling and soldering the flanges to the spools. After assembly, the work was placed in the preheating tray. Six pieces were taken from the preheating tray and were laid on the aluminum channel as at *H*. After reaching soldering temperature, the joints were touched with a brush that had been dipped in a liquid soldering flux. They were then touched with a thin ribbon of solder, which quickly flowed around and into them. The completed work is shown at *J*. After assembling and before soldering, the parts were dipped in acid to clean them and make the soldered job neater and more perfect. One operator will assemble and solder 100 parts per hour.

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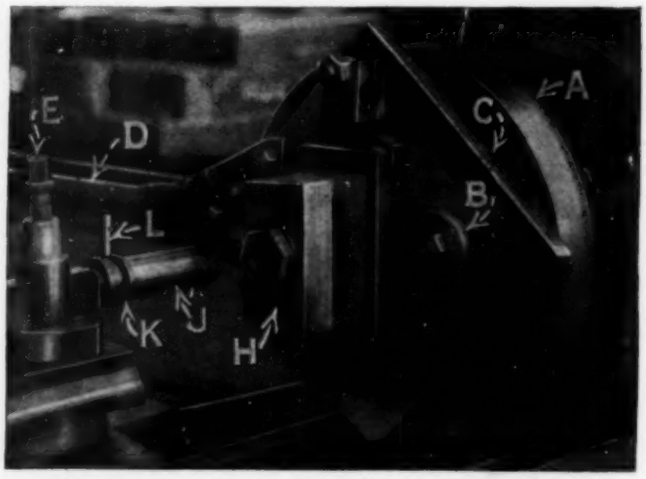
Turning Curved Surfaces

MATTHEW HARRIS

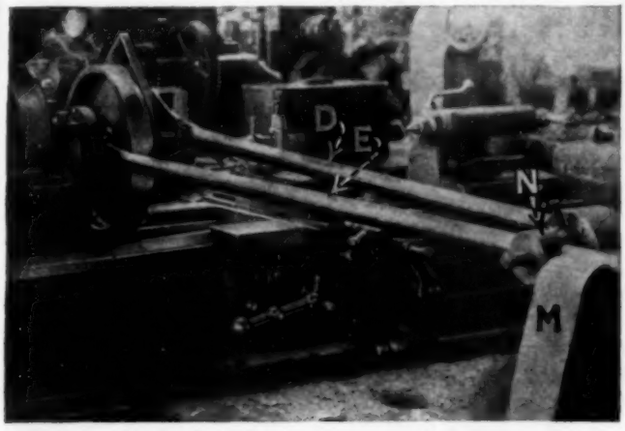
In machining link blocks to fit the links of locomotives, unless some special facilities for machining the curved surfaces are at hand, the fitting is somewhat of a job, as



the radius of curvature is such as would require the use of a lathe or a boring mill of great swing. However, the illustrations show a method by which the curved surfaces are machined in a lathe of comparatively small

swing in the shops of the Central of Georgia Railway, Macon, Georgia.

Referring to Fig. 1, *A* is a faceplate screwed on the spindle of the lathe, and fitted with the crankpin *B*. A plate *C*, slotted to fit the crankpin, is held against the faceplate by a nut and a large washer. The rod *D*, attached to plate *C*, is fulcrumed on the stationary rod *E* at a distance from the lathe center equal to the radius center of the link block. It will readily be seen that with



the lathe in motion, the crankpin must impart vertical motion to the plate *C*, which is prevented from free horizontal movement by the fulcrumed rod attached to it. Thus the resultant motion must be an oscillating one in the path of an arc, the radius length of which is governed by the position of the fulcrum.

The link block *H* is mounted on a fixture attached to the plate *C*, the fixture being bridged over the slot to permit the nut and the washer on the crankpin to pass under it. The toolbit, held in the sleeve *J*, is so mounted as to permit it to clear the work on the back stroke. A cam-shaped slot at *K* and the pin *L* cause the sleeve to move slightly to the right as the toolbit lifts, thus permitting the toolbit to clear the work both vertically and horizontally. The pin *L*, in addition to its function as a cam pin, acts as a stop, bearing against the end of the slot when the tool is cutting. A spring returns the toolbit to cutting position upon the completion of the back stroke.

In Fig. 1 the tool is set for machining the inner or concave surface of the block. For machining the outer or convex surface, the sleeve is turned half a revolution and the toolbit is reversed, the cam-shaped slot being long enough to permit this adjustment.

The method of setting up the device is shown in Fig. 2. One end of the stationary rod *E* is attached to the protruding end of the front bearing of the spindle, while the other end rests in a notch in the block *M*, which stands on a bench nearby. The fulcrum pin *N* can be secured at any position on the rod to suit the radius of the link block to be machined. Graduations on the rod facilitate setting the fulcrum pin to any radius length desired.

■

Chippers working on the same job should work back to back to avoid danger. If this is impossible, a burlap screen will prove effective.

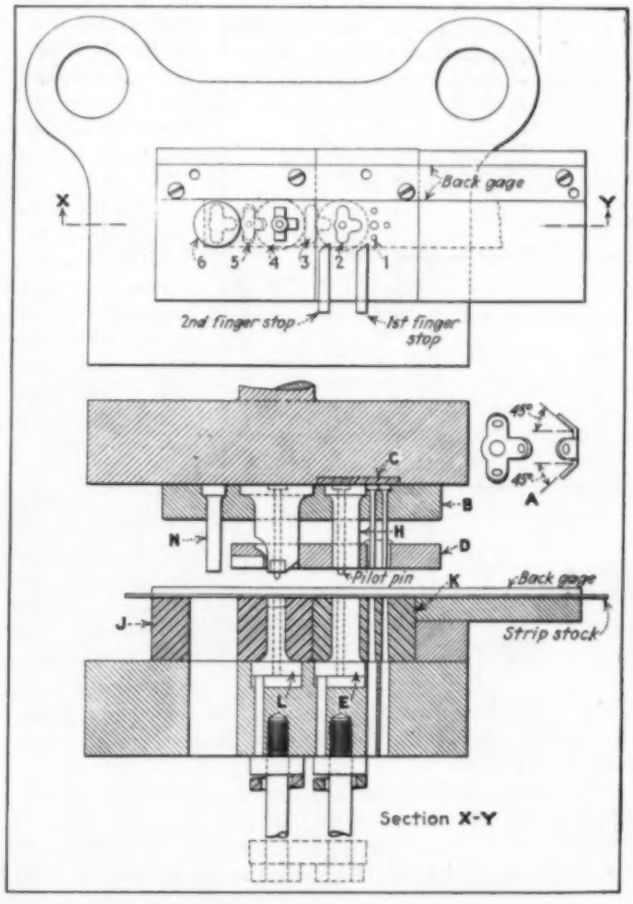
Progressive Press Tools

C. W. HINMAN
Chief Tool Designer, Kobzy Tool Company

The tools here described are for perforating, blanking, forming, and ejecting three-way terminals, such as the one shown at *A* in the illustration. In the first position, the four holes are punched in the work, the end of the strip stock being against the first finger stop. The perforating punches are held in the punch plate *B*, are backed up by the hardened plate *C*, and slide through hardened bushings in the stripper plate *D*, as shown. In the next step, the stock is pushed against the second finger stop, and when the punch descends the blank is cut through the stock, depressing shedder *E* in the die against a spring beneath the die-shoe. This spring pushes the blank back into the strip on the up stroke while the stock is still held flat on the die by the stripper plate. To locate the strip stock for blanking, a pilot pin in the blanking punch *H* enters the 5/32-in. hole in the center of the blank.

At position three, no operation is performed. The blank is carried in the strip past this point because a division between the blanking and the forming die-blocks is necessary here for the following purpose: When the blanking die becomes dull on its contour edges and grinding becomes necessary, an equal amount must be ground off of the bottom of the forming die-block to maintain a smooth surface along the tops of die-blocks *J* and *K*, so as to prevent any interference when passing the stock along.

At position four, the three ears, or terminals, are



formed, each to an angle of 45 deg. The forming die *L* is flush with the top of the forming die-block *J* and slides within it, contacting positively in the die-shoe at the moment the forming punch *M* completes its work. As the ram ascends, the formed work is pushed back into the strip of stock by the forming die, actuated by a spring. The formed work is held in the strip by its entire contour, excepting the three projecting ears.

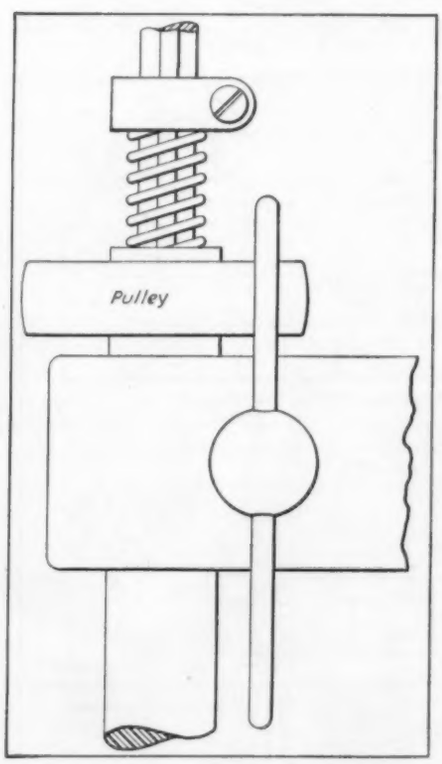
Position five is idle for the purpose of locating position six a practical distance from the base of the forming die. A small recess is milled in the stripper plate at position five, which is sufficient to clear the formed ears on the work. At position six, the punch *N* pushes the completed piece out of the strip and through aligned holes in the forming block and the die-shoe, permitting it to fall into a receptacle beneath the press.

The making of these terminals is a high-production job, the strip stock being fed through the tools by an automatic roll-feeding attachment built on the bolster plate of the press, but not shown in the illustration.

■

Rigid Feed-Attachment for the Drill Press
Discussion

G. R. RICHARDS
Chief Tool Designer,
Weston Electrical Instrument Corporation



In an article under the title given above, on page 633, Vol. 73, of the *American Machinist*, Harry Moore describes an attachment to the drill press to prevent the breakage of small drills. The reason for such breakage is, of course, that the hand and the arm of the operator meet with less resistance at the instant the drill is coming through the work, and his muscles do not react quickly enough to prevent the drill from coming through suddenly. Consequently, the flutes of the drill catch upon the burrs formed on the bottom of the work, often causing breakage.

The illustration shows a simpler method of accomplishing the result described by Mr. Moore. A stiff spring is placed over the spindle, between the pulley and the stop collar, and the stop collar is set to contact with the spring just before the point of the drill comes through the work. When the drill point comes through the work, the hand and the arm of the operator meet with the resistance of the spring, preventing the drill from breaking through suddenly.

■

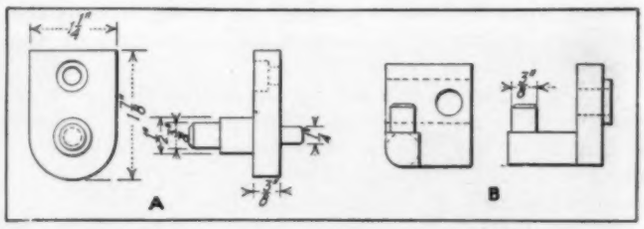
Stops for Length Measuring

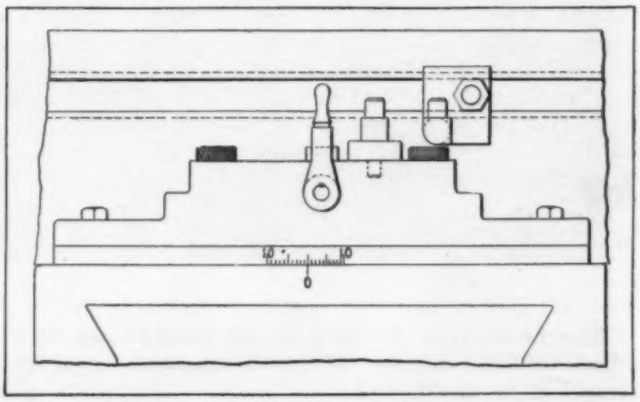
R. F. SKEDEL
Skedel Machine and Tool Works

Where jig plates are to be bored in the milling machine, the screw for the longitudinal feed of the table can not be depended upon for accuracy; therefore it is necessary to use some other means for determining the center distances of the holes to be bored. A device that is used successfully with a vernier caliper is illustrated.

The stop *A* is attached to the saddle, and *B* is fitted to slide in the dog slot of the table, where it can be locked in any position. The stops are set so that their cylindrical parts are a known distance from each other, as measured by the vernier caliper. After the first hole has been bored, the vernier caliper is set to the center distance between that hole and the next hole to be bored, plus the distance over the cylindrical parts of the stops. The table is then traversed until the cylindrical parts of the stops are at a distance that will permit the jaws of the vernier caliper to be placed over them.

In this position the second hole can be bored with assurance that it is the correct location. For the third hole, the vernier caliper is set to the center distance between the second and third holes, plus the measurement last made, and so on until all the holes have been bored. If the distance between the first hole and any other hole to be bored is greater than the range of the vernier caliper, the movable stop can be reset after any hole has been bored, without moving the table, and the distance over the cylindrical parts of the stops can be taken as the point of departure for the next hole. In making the measurements, the jaws of the vernier caliper should rest on the shoulders of the stops.

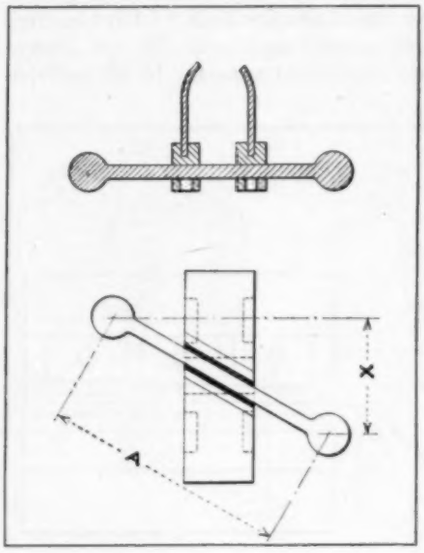




Checking the Angles of Helical Gear Teeth

GEORGE BELBES
Teletype Corporation

The device illustrated was made and successfully used for checking the angles of the teeth in helical gears. It consists of a straight shaft having balls soldered to its ends, and two flat springs slidably mounted on the shaft, provision being made for locking the springs by setscrews in any desired position. The springs are of such form and length as are best adapted for holding the device on the gear to be checked.



Having set up the device by placing the shaft in one of the tooth spaces and adjusting the springs to hold it in alignment, the distance X is measured by a height gage equipped with an indicator. Knowing the distance A between the centers of the balls, and having found the distance X, the sine of the helix angle of the teeth in relation to the axis of the bore can be found by dividing X by A. This angle can be found in the table of sines contained in all engineer's handbooks.

■

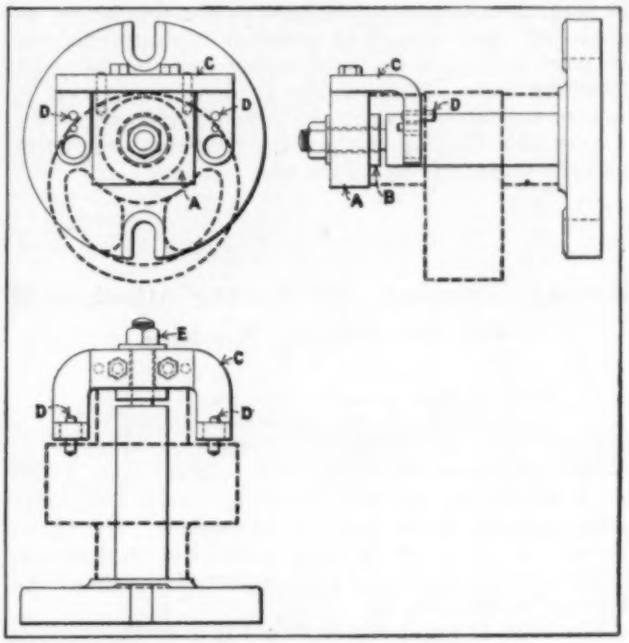
Drill Jig for an Eccentric

CHARLES C. TOMMEY
Chief Tool Designer,
Brunswick-Kroeschell Company

A jig for drilling two tap holes in one side of our eccentrics is shown in the illustration. The holes are for attaching what we call thrust blocks, and they must be accurately equidistant from the center line of the throw. The base of the jig and the upright are of cast iron and are integral, the upright being a running fit in the bore of the eccentric. Bolt slots in the base, diametrically opposite one another, are for bolts for clamping the body of the jig to the table of the drill press.

The square piece A is also of cast iron and has a pilot B that is a running fit in the bore of the eccentric. The steel strap C, of which the bushing plates are an integral part, is heated and bent to the shape shown, and is attached to the square piece. Two pins D are driven through the part C and project below it far enough to contact with the finished diameter of the eccentric on each side of the center line of the throw. These pins located the bushing plates with reference to the center line of the throw. A slip bushing is used to guide the drill and is prevented from turning by a pin in the bushing plate engaging a slot in the flange.

In operation, the jig is set and clamped to the drill-press table so that the bushing, being in position for one of the holes, is directly under the drill. After this one hole has been drilled and tapped, the bushing is changed to the other bushing plate, and the nut E is loosened. The strap, bushing plates, and the eccentric are then rotated together about the upright, the pins D



keeping all parts in correct relation to each other. When the parts have been rotated far enough to bring the bushing directly under the drill, they are locked by tightening the nut E, and the second hole is drilled and tapped. The base of the jig remains stationary at all times.

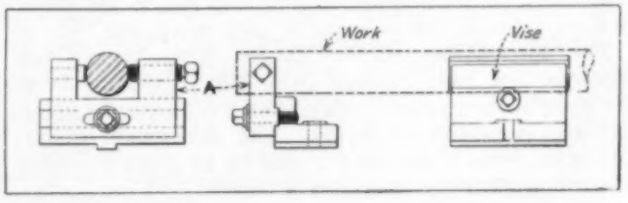
■

A Floating Outboard Support

F. H. MAYOH
Designing Engineer, Package Machinery Company

When work too long to go between the centers of the milling machine is to be operated upon, the only alternative is to hold it in the vise. Sometimes two vises are used, but there is always the difficulty of bringing their stationary jaws into accurate alignment. Therefore it is better to use a floating support for the overhanging end of the work. Such a support is shown in the illustration.

The work is gripped in the vise, locating it parallel with the surface of the table by means of an indicator. If the vise and the table are in good condition, the work will be brought in line with the center of the table by



the key in the bottom of the vise engaging the table slot. On an angle bracket attached to the table is mounted the yoke *A*, held in place by a shoulder screw. The yoke has a tongue fitting a slot in the bracket and has an elongated hole for the screw, permitting free crosswise movement when the screw is loosened. A screw and anvil in the upper part of the yoke grip the work.

In operation, after gripping and leveling the work in the vise, and with the yoke held to the bracket by its screw just tight enough to permit it to float crosswise, the work is gripped by the clamping screw in the yoke. Then the screw attaching the yoke to the bracket is tightened securely, making the yoke a rigid part of the bracket, and holding the work in accurate alignment with the stationary jaw of the vise.

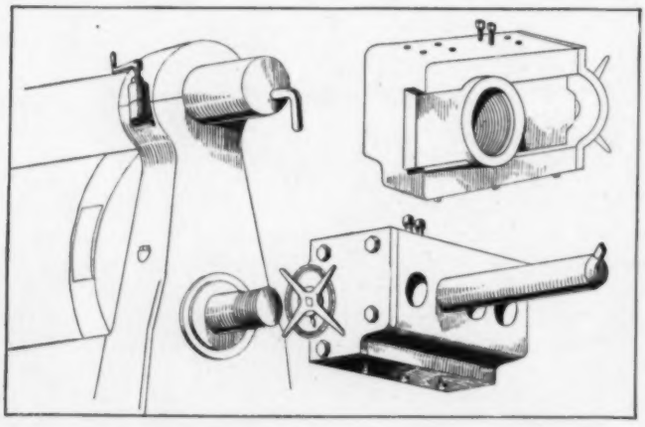
■

Boring, Turning, and Facing Attachment for the Milling Machine

NORMAN E. POTTS
Chief Engineer, Domestic Refrigerator Division, Ruddy Manufacturing Company, Limited Brantford, Canada

The attachment illustrated will enable work to be bored, turned, and faced in the milling machine, the work being mounted on the table of the machine. By its use boring and facing can be done up to 12 in. in diameter, and projections on the work can be turned to a maximum diameter of 10 inches.

The body of the device is threaded to fit the machine spindle, and has slidably mounted on it a dovetailed block for carrying the tool. The block is gibbed to the body and can be moved along it by a screw having a lead of $\frac{1}{10}$ in. It has a maximum travel of $2\frac{1}{2}$ in., and holes on 2-in. centers are provided for boring bars and other tools, which are firmly held by two setscrews.



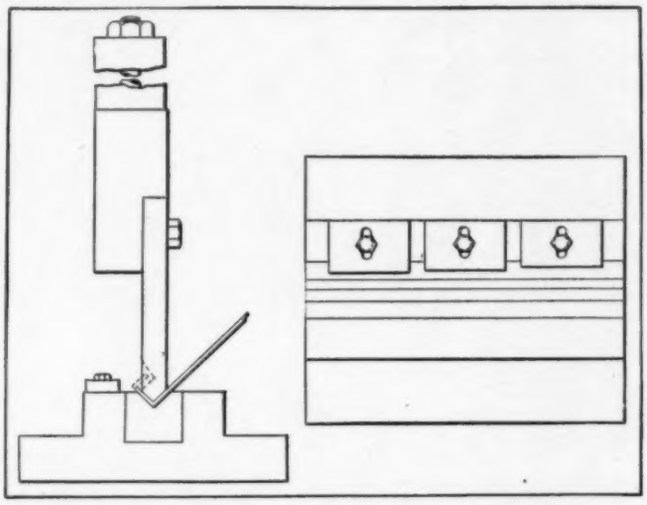
Attached to the toolblock is a micrometer dial having 100 divisions, so that turning the screw one division moves the toolblock 0.001 in. The facing feed is actuated by a four-arm star wheel attached to the screw striking a pin in the overarm at each revolution.

The outstanding features of the device are: Compactness, not having more than 2-in. overhang from the spindle; fine adjustment of the tool; extreme rigidity; and simplicity of design. Our investment in this device has been many times repaid by its great flexibility in application to many classes of work.

Three-Direction Bending Tools
Discussion

T. SMITH
Sutton in Ashfield, England

The tools described by D. A. Baker in an article on page 253, Vol. 73, of the *American Machinist*, are certainly very ingenious. However, I believe they will be slower in action than would simpler tools. I have learned from experience that complicated tools do not always show the saving that one would expect. In all multiple



bending in presses, the time taken to place and remove the work is the deciding factor as to how many bends can be made economically at once.

The time taken to remove the finished work from the tools shown by Mr. Baker will be considerable, owing to the shapes of the bends. Simple tools cost less, and in many cases, the cost per gross of the work made by them is less than that made by multiple-operation tools. For instance, the work shown by Mr. Baker could be bent on the ends by simple stock tools in a hand press. After the first bend (shown in dotted lines in the accompanying illustration) has been made, the operator pushes the work against the stop and makes the second bend, both bends being made without letting go of the press lever. There are three stops, as can be seen in the plan view at the right. They have elongated holes for the screws, and each one can be independently adjusted.

The bending punch is notched so as not to interfere with the first bend when the second bend is made, the notch being the only alteration made in the stock tools. Still holding the press lever, the operator reverses the work and makes the short bend on the opposite end. The compound bend in the middle of the piece could be made in another operation by simple cast-iron tools, since there are no sharp corners required, and the cost will be about the same as that for the bends at the ends.

A girl operator will make the end bends in 50 gross of pieces per $8\frac{1}{2}$-hour day, the labor cost being one penny per gross. As the labor cost for all the bends will be about two pence per gross, it will be seen that the tool cost is the greater item. In many cases, work can be made by simple tools, requiring but little alteration, cheaper than by multiple-operation tools, both in labor cost and the cost of the tools themselves.

Types of Disappearing Gage Pins for Dies

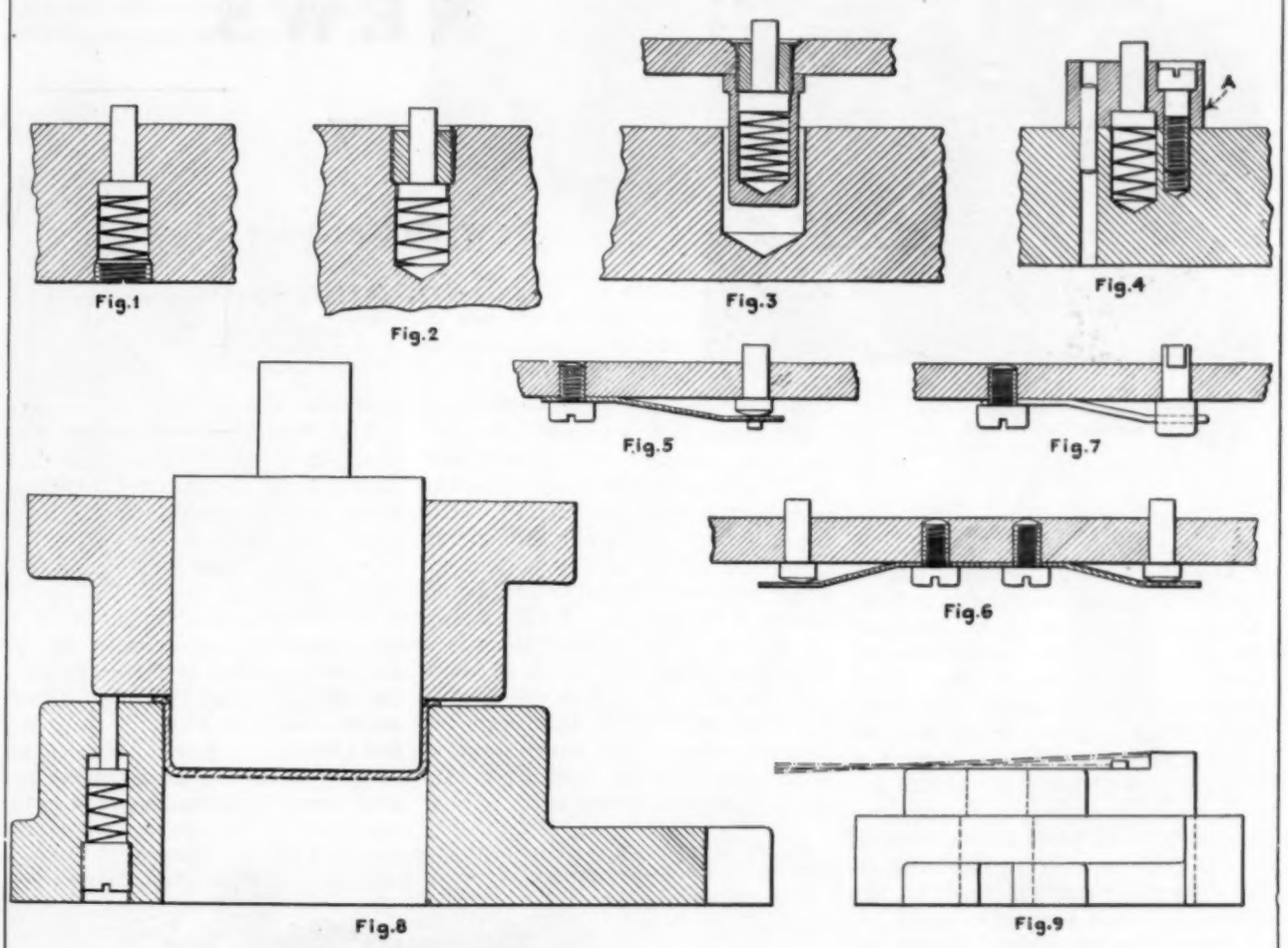


Fig. 1—This type can be used where the shoe is heavy enough to house the spring and plug. The pin should be loose enough to slide freely, but not loose enough to collect dirt

Fig. 2—Where the base is exceptionally thick, it is better to drill from the top

Fig. 3—Same type as Fig. 2 hung to a movable stripper. The spring socket enters a clearance hole in the die shoe

Fig. 4—Built-up in holder. Piece *A* is held by two screws and two dowel pins

Fig. 5—Flat spring type. The pin end of the spring is slotted to prevent turning

Fig. 6—Where two pins are used and the spring is held by two screws, it is not necessary to slot the ends of the spring

Fig. 7—The up and down movement of a pin tends to rotate it slowly. Drilling the head for a wire prevents this. This type may be flatened on the side or sides, if necessary

Fig. 8—Application to a shell drawing die in a double acting press. Two pins are used to gage the blank, and are depressed by the blank holder

Fig. 9—In some cases it is desired to punch holes at different distances from the edge in the same die. The disappearing gage pin permits this

Contributed by Edward Heller

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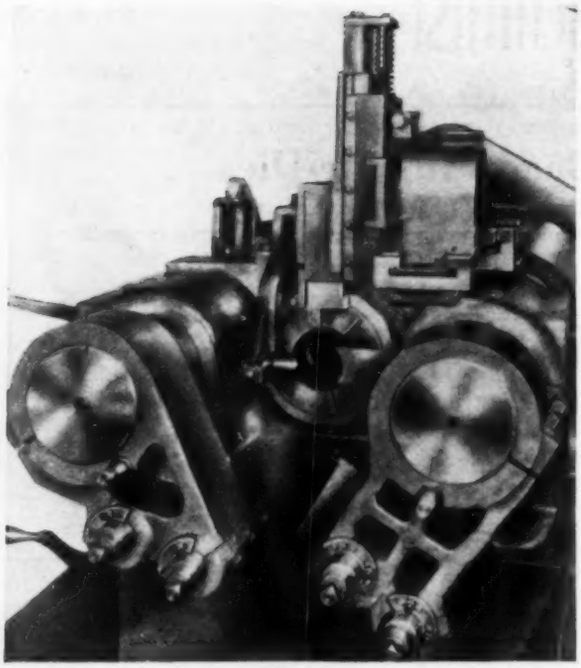
SHOP EQUIPMENT NEWS



Front end, showing the chuck, the two standard toolholders, and a special toolholder mounted above the work

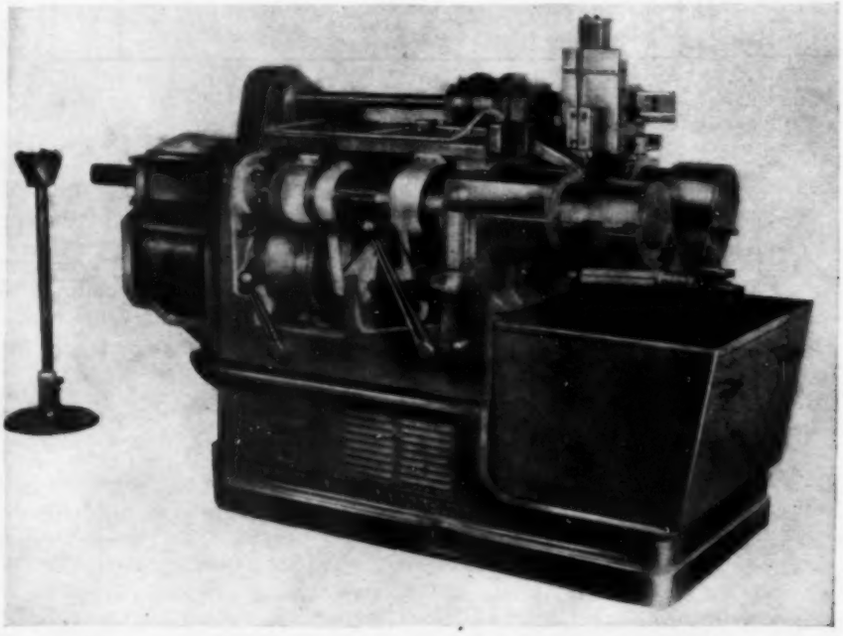
New Britain-Gridley 5-In. Automatic

AN ADAPTATION of the No. 38 New Britain-Gridley single-spindle automatic chucking machine, which converts it into a bar machine for stock up to 5 in. in diameter, is now being produced by New Britain-Gridley Machine Company, New Britain, Conn. In addition to building the same basic machine for either chucking or bar work, the makers are prepared to furnish the necessary extra parts for converting it from one purpose to the other or for converting existing chucking machines to handle bar work.

Aside from the hollow spindle required on the bar machine, the extra bar-feeding mechanism and a few minor parts, the two types of machine are identical and have interchangeable parts. Components of the machines are: a massive frame near the top of which the main spindle is located; a pair of heavy shafts that act as tool slides, one on each side of the spindle; a pair of camshafts with connecting linkage for giving the tool slides the required longitudinal and oscillating movements; and the mechanism for driving the machine, operating pumps and chucks, and performing the required supplementary operations.

A silent chain arranged for a diamond-shape drive transmits power from the 10-hp. flange-mounted motor within the base to a transverse shaft carrying a hardened steel worm that meshes with a bronze worm on the main spindle. A second cross-shaft, driven by a third sprocket, operates the high-speed return mechanism. This cross-shaft also drives a vertical shaft, at the bottom of which is the centrifugal coolant pump having a capacity of 75 gal. a min. At the top of the vertical shaft is a Tuthill oil pump that serves to lubricate the machine, and, in the case of the chucking machine, to operate the hydraulic chuck. The fourth sprocket is an adjustable idler which takes up chain slack and serves as an adjustment when the sprockets are changed.

The two standard toolholders are moved longitudinally by slotted drum cams and are fed into the work by a radial cam mechanism. The maximum longitudinal movement is 4 in. If required, a third toolholder can be fitted above the work. On the bar machine the bar pusher and the chuck are operated mechanically by the mechanism added at the rear end of the machine. The collet locking mechanism comprises about 30 $\frac{3}{4}$-in. steel balls which are forced between convergent planes by an encircling profiled sleeve. This assembly is in bal-

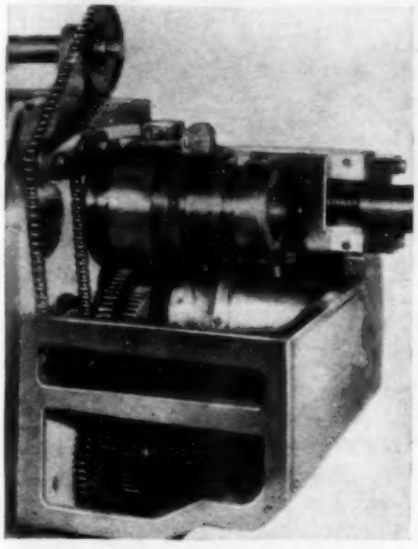


New Britain-Gridley 5-In. Bar Machine with front cover removed to show one camshaft and one tool slide

ance and unlocks instantly without regard to spindle speed.

Clutches used in the control of the machine are of the multiple-disk type. Hand controls are arranged to afford maximum safety to the operator, who, because of the position and interlocking of controls, is forced to stand with hands away from the work when the machine is started.

All wearing surfaces are hardened and ground, and are provided at all



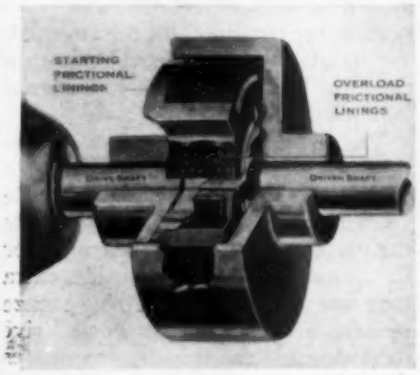
Rear end, showing the bar-feeding mechanism. The roller chain drives the special tool mounted on top of the machine

times with a flood of lubricant. Heavy and rigid parts contribute to the accuracy of the work, as does also the use of oversize pre-loaded ball bearings on all shafts, including the camshafts. Production rates are said to be limited only by the maximum allowable cutting speeds of the tools used, and can be varied as desired by changing sprockets on the main drive.

The large chip pan can be emptied with practically no loss in production time. A screen covering the entire bottom of the pan permits the coolant to flow by gravity into a reservoir.

Rawson Automatic-Starting Flexible Coupling and Clutch

Centrifugal action is the fundamental principle of the Rawson automatic starter and flexible coupling announced by The Washburn Shops, Worcester Polytechnic Institute, Worcester, Mass. The device consists of two cast-iron members, one attached to the driving shaft and the other to the driven shaft. Between the driving and driven members are inserted floating segments made of brake lining reinforced with lead, a



sufficient amount of lead being used to give the required pressure on the friction surfaces for carrying the load. Clearance is allowed between the driving and driven members and also between the floating friction surfaces.

With the application of power, centrifugal force begins to act on the outer set of linings. There is sufficient lag, however, to allow the driving member to come to full speed before centrifugal pressure takes effect on the driven member and, in addition, the design is such that the centrifugal action on the driving side is never greater than the motor rating.

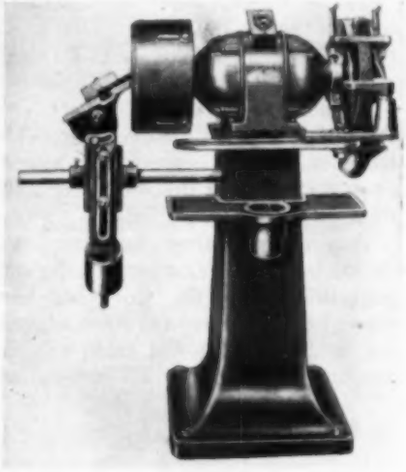
In starting a load with a clutch capacity for only the rated power of motor, some time would be required and considerable heat might be generated. In order to overcome this objection and to give sufficient overload capacity, a second set of centrifugal friction linings is introduced on the driven side, thus giving an auxiliary source of driving. This auxiliary power can be made in any amount desired, varying with the type of load and the overload requirements.

This starter is usually applied to motors, but may be applied to other types of driving units. It may also be applied to the driven unit. It can be arranged for direct connection, gear, chain, V-belt, or flat-belt drives. No limit is set on the amount of power that can be transmitted with the design. It will operate in either a horizontal or vertical position, or in either direction of rotation.

Among the advantages of the Rawson starter are: Reduces peak load requirements for driving units; absorbs shocks and reduces wear and tear to both driving and driven units; standard motors and in many cases smaller motors may be used; minimum power is required and power factor is improved; wholly automatic operation, and inclosed design. The coupling is built in sizes to transmit from 3 to 300 hp.

"U. S." Tungsten-Carbide Tool Grinder

An adjustable table and a sliding guide, which together hold the tool securely at any angle against the cup wheel, are employed on the tungsten-carbide tool grinder announced by the United States Electrical Tool Company, 2490 West Sixth St., Cincinnati, Ohio. These devices are



"U. S." Tungsten-Carbide Tool Grinder, which employs an adjustable table with sliding guide for holding the tool

The tool rest of the "U. S." Tungsten-Carbide Tool Grinder is set to any angle by means of a protractor

said to prevent grinding away more of the tool than is absolutely necessary to sharpen it. Any angle for the tool rest is set to the protractor markings. The tool rest is also adjustable for height and for wheel wear.

Other features of the grinder include: a 2-hp. motor operating at 1,750 r.p.m.; push button control; SKF ball bearings, and a boiler plate wheel guard adjustable for wheel wear. The grinder can be furnished as shown or with a cup wheel and swinging table on both ends.

Grant Model No. 3A Rotary Vibrating Riveter

Another size in its line of rotary vibrating riveters has been announced by The Grant Mfg. & Machine Company, 90 Silliman Ave., near Fairfield Ave., Bridgeport, Conn. This No. 3A machine will head rivets cold from $\frac{3}{16}$ to $\frac{5}{16}$ in. in diameter. The hammer spindle is caused to vibrate in a vertical direction between 1,400 to 2,000 blows per min.

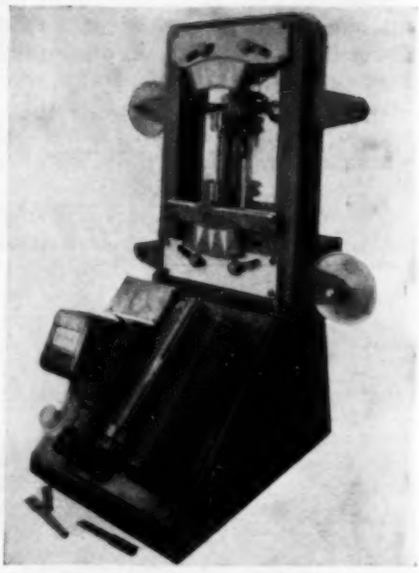
As in the other machines, the frame is a single casting and the support underneath the work has been made heavy. The operation of raising and lowering the table a small amount is done by turning the adjusting screw in the bracket beneath the table. For greater adjustment of the table, the adjusting bracket is moved to the next cross slot. To permit the fixtures to be attached, the standard table is provided with a flat top, but a specially constructed table can be furnished.

The riveting tool or peen is threaded to fit the outside diameter of the hammer spindle and is made from hexagon stock, as this permits the use of the wrench. Bearings for the hammer spindle are made extra long and are of special bearing bronze to minimize wear. The worm drive located inside the spindle arm rotates the spindle in the clockwise direction. The worm shaft is driven by a V-belt connecting with the main shaft in the rear of the machine. The main pulley has been made part of the clutch mechanism and means for lubricating it are provided. Ordinarily a 1 hp. motor is supplied. Thrust ball bearings are used to take the thrust between the bronze nut on the mainshaft bearing bushing and the inner clutch plate, and also the thrust of the mainshaft at the left side of the machine; that is, between the small pulley for driving the spindle worm and the frame.

Foeppl-Heydekampf Static and Dynamic Bending Machine

A bending machine for static and repeated reversed loads has been placed on the market in this country by the Southwark Foundry & Machine Company, Testing Equipment Division, Philadelphia, Pa. This machine is known as the "Foeppl-Heydekampf" and is built in Germany. It is especially suitable for short-time determinations of the fatigue limit of materials for machine parts. The features are as follows: Simplicity of construction; no moving parts to wear out; easy operation; simple shape of specimen; versatility of measurements; the results may be checked; clamping effect is eliminated, and quiet operation.

In the lower part of the frame is built a switch panel containing all necessary operating and controlling instruments. Connection of the set to a 110- or 220-volt d.c. source makes it ready for operation. The bottom



of the specimen is rigidly clamped to the frame and the top is connected with an oscillating mass of considerable length. Usually the tests are run with two specimens at once. Two blade springs are mounted in a manner similar to the specimens, but they are not intended to break, being thinner than the specimens. The springs, the specimens, and the oscillating mass form a mechanical swinging system, which is excited by two pairs of electromagnets, alternatively giving impulses to the mass. The magnets are switched on and off by a special lever contact device. The switch lever is moved by the mass due to friction, so that the number of impulses agrees with the natural frequency of the oscillating system. Amplitude of the oscillation is varied by changing the current value in the electromagnets.

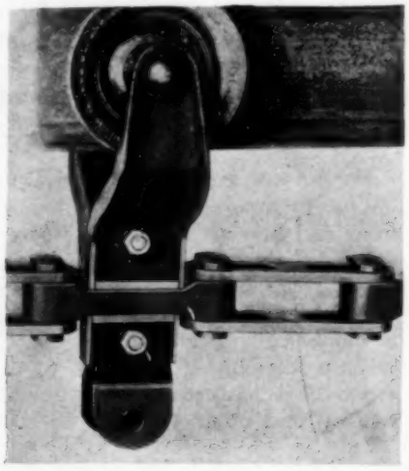
Amplitude of vibration can be read from the special visual reading devices attached to the ends of the mass. Both devices give the same reading, checking each other. The stress in the specimens is proportional to the amplitude within the range of Hooke's law. If Hooke's law is exceeded, the exact determination of the stress has to be done by the additional static loading arrangement furnished with the machine.

An outstanding feature of the machine is that the stress is constant over the full gage length of the specimen. The acceleration forces during the oscillation are pure moments. Failures are therefore not restricted to a certain part of the specimen but occur where the weakest point is.

The number of cycles per minute is counted by an electric counter driven by a small synchronous motor in series with the pulsating current line feeding the electromagnets. An adjustable automatic contact mechanism stops the machine after a failure.

Saginaw Conveyor Trolley and Chain

An improved conveyor trolley and chain have been announced by the Saginaw Products Corporation, Saginaw, Mich. The bracket assembly extends down through the chain link with the chain attachment lugs bolted directly to the bracket tongue. This tongue projects below the lower side



of the chain. Instead of having the bracket assembly made by the erection crew, it is made by the manufacturer and delivered ready to roll onto the track. In attaching the chain, the only operation necessary is that of raising the chain so that the bracket tongue projects through the proper link and then bolting the attachment lugs in place. One bolt secures both lugs and one man easily handles the operation.

No tendency to grow when subjected to alternate cycles of heating and cooling is evident in the Saginaw chain. It takes both horizontal curves and vertical dips with a minimum of chain pull and without vibration or chattering. The trolley operates with standard clearances on any 4-in. I-beam track. The No. 458 chain is interchangeable with the usual drop-forged No. 458 chain and is used on the same sprockets.

Swartz Clamping Lock and Standard Fixtures

A clamping lock and a line of standard fixtures have been placed on the market by the Swartz Tool Products Company, 6442 Epworth Blvd., Detroit, Mich. The clamping lock may be applied to various types of fixtures and is automatic in its locking action. Three sizes are manufactured; namely, $\frac{3}{4}$, 1, and $1\frac{1}{4}$ in., representing the size of shaft upon which the locks are mounted. Direct-drive design is employed for the lock, and thus there is no retarding friction built up as the pressure is applied. All internal parts are hardened and ground. Assembly of the lock to the fixtures is readily done since but three holes need be drilled and tapped. A small retaining collar, which clears the hexagon driving member, allows the use of slip-on socket wrenches where the lock is used on index-type fixtures.

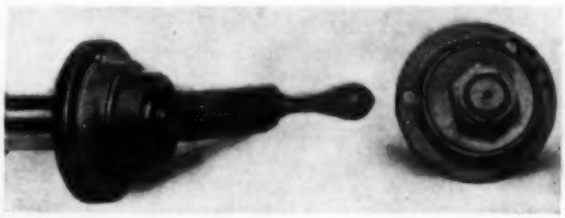


Fig. 1—Swartz Automatic Fixture Lock at the left with wrench and large retaining collar. At the right is a standard fixture lock with small diameter retaining collar to allow the use of slip-on wrenches for indexing fixtures

The standard fixtures are made in three open-side types and in one closed-end type. Two-post design and flanged shoulders maintain alignment between the head and the base under heavy clamping pressures. The type L fixture is arranged for solid clamping. Between the posts is a draw-rod for moving the head into and out of the clamping position. Both the operating lever and the head remain in the position to which they are moved by the operator. In Fig. 2 is shown the Type LS fixture, which is offered especially for chucking parts that must be located centrally, but which have no projections. It is therefore suited to such parts as gear blanks. This type of fixture employs the standard lock, and a spring inside the housing for the head-operating shaft affords a flexible clamping means.

Type LH fixtures are heavy-duty types made in a variety of sizes. This type is shown in Fig. 3, and may be made to chuck up to six parts all with a single movement of the lever. It is adapted to such long parts as automobile manifolds. The Type LS flexible-spring clamping fixture is also made for work that does not require the solid lock clamping feature of the other types.

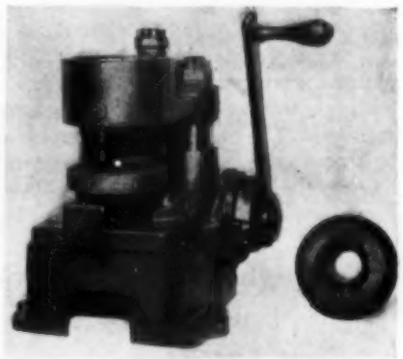


Fig. 2—Swartz Type LS Standard Fixture, which has flexible spring clamping means for holding parts that must be located centrally but which have no projections

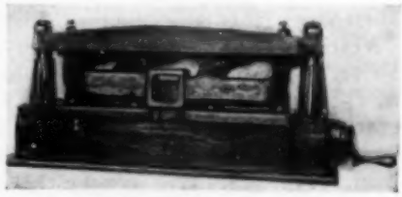
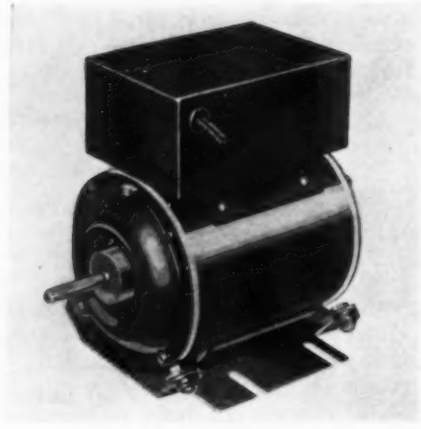


Fig. 3—Swartz Type LH Standard Fixture of heavy-duty design for such parts as automobile manifolds

Howell Type CI Fractional-Hp. Motors

A complete line of fractional-horsepower motors from $\frac{1}{10}$ to $\frac{1}{3}$ hp. has been placed on the market by the Howell Electric Motors Company, Howell, Mich. This line consists of condenser start, split-phase, and polyphase motors, all built to the same frame dimensions.

The condenser motor has the con-



Howell Type CI Condenser-Type, Fractional - Horsepower Motor

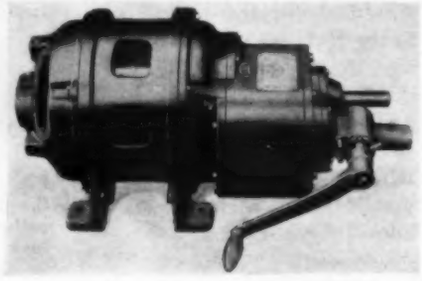
denser mounted in a compact box at the top with all connections made inside. It may, however, be mounted on the side of the motor or at any convenient place on the driven appliance, or on the wall. The condenser motors are the high-starting-torque, constant-speed type, having at full voltage a starting torque of from 300 to 400 per cent of full load torque, and a maximum running torque of at least 200 per cent. They are of squirrel-cage construction and are without a commutator or wound rotor.

The split-phase motors are built in the same frames as the condenser motors, and are built to conform to both the short-term and long-term ratings. They are built with either ball or sleeve waste-packed bearings having the same dimensions.

Westinghouse-Wise Multi-Speed Drive

A multi-speed reduction gear unit built in combination with a standard a.c. motor has been developed by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. Constructed to give four different speeds to the output shaft at constant horsepower, this unit is known as the "Westinghouse - Wise Multi - Speed Drive." With this drive the speed of the driven apparatus may be changed instantly while the motor is running at full speed and under full load. All gears are constantly in mesh, and in no way can the operator injure the unit by changing speeds at any time.

This gear unit is mounted on a standard Westinghouse squirrel-cage induction motor. In the gear unit, a pinion mounted on the motor shaft drives a gear mounted on the countershaft. Also on the countershaft are four idling ring gears which are constantly in mesh with four gears that are pressed on the output shaft. Each of the countershaft gears is provided with an internal clutch which is made to fit the bore of the gear. The clutch is actuated by two tapered wedges which are forced between the clutch halves by a spring member. To bring this member to the correct position for a desired speed, the control handle, which is provided with a spur pinion, is rotated, actuating a rack which is mounted on the spring



member. This movement brings the spring member between the tapered wedges, thereby providing the pressure for clutching any one of the four ring gears to the countershaft, which in turn drives the output shaft at the desired speed.

Between each speed is a neutral position. To disengage the clutch and bring it into a neutral position, it is only necessary to rotate the handle to draw the spring member into a position which does not contact the expanding wedges. A further movement of the handle brings the spring member into contact with the next set of expanding wedges, and clutches the next gear to the countershaft. Therefore, it is not only possible to make speed changes under full load, but the apparatus can be stopped or started under that condition.

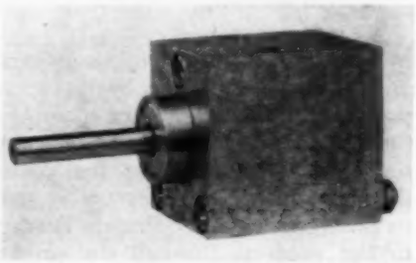
Ball bearings are used in both motor and gear unit, assuring alignment of the shafts. The gearing in the first reduction, or drive from the motor to the countershaft, is of the single helical type, insuring quietness of operation, and the other gears on the countershaft and those on the output shaft are of the spur type. All gearing is heat-treated. A splash system is provided for lubricating both the gearing and the bearings. An oil gage is provided for checking the oil level.

Because the motor and gear drive are built as one unit, installation is simplified, less space is required, and only one mounting bracket or foundation is needed, since this unit is applied exactly like any motor.

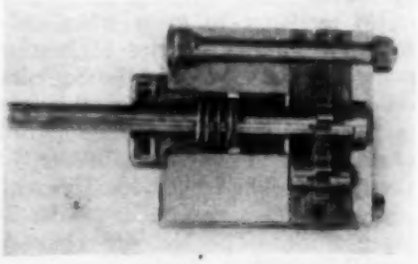
Applications for a multi-speed industrial drive are many. It is particularly adaptable to machines on which pieces of both large and small diameters are turned. When the quantity of material to be delivered by a conveyor varies, the conveyor drive should be variable in speed. Wood-working tools also very often call for variable or multiple speeds. The drive is offered in three units, ranging in rating from ½ to 7½ hp.

"Northern" Nitralloy-Steel Pumps

For service in pumping lubricating oils up to pressures of 1,000 lb. per sq.in. and fuel oils at lower pressures, the Northern Pump Company, Minneapolis, Minn., has developed a line of Nitralloy steel pumps. This alloy is employed for all working parts, because it is highly resistant to the action of acids commonly found in fuel oil and other oils, and because



"Northern" Nitralloy-Steel Pump having all working parts of this wear-resisting steel



Cutaway view showing the Nitralloy steel plates forming the pump chamber

of its extreme hardness it is not scratched when foreign matter is present in the liquid. For example, after two weeks of pumping a mixture of fuel oil and sand, the pump was found to show no signs of wear.

As noted in the accompanying cutaway view, the Nitralloy steel shaft is hardened and ground. A bearing nut centers the shaft for the end mounting, and oil is prevented from leaking out by means of an oil retainer. The spring provides for automatic packing adjustment. The pump body itself is made of solid steel to prevent distortion from pipe strain. It can be drilled and tapped to permit mounting the pump in any position. Surrounding the gears are three plates of Nitralloy steel. Beyond them on the end of the shaft is a Nitralloy collar which takes the thrust. The entire assembly is held together by means of three, large fitted dowels. Pumps of this design are built in capacities from 0.55 gal. per min. at 1,800 r.p.m. and 25 lb. per sq.in. and up.

Lewis-Shepard Portable Cranes

Four types of portable cranes have been developed by the Lewis-Shepard Company, Watertown Station, Boston, Mass. The hinged type is illustrated and is probably most suited to general applications, since both the boom and the main upright are hinged. The advantage of this type of crane is that it can be taken through practically any doorway and yet can be used to the full height of the ceiling. A telescopic type machine is also manufactured which can be made to accommodate practically any ceiling height and yet can be taken through the ordinary doorway.

A revolving hinged type, which will swing through an arc of 360 deg., and a revolving telescopic type are the remaining two designs. All these machines can be furnished with a hand worm drive winch, a hand spur drive winch, or an electric drive winch. Air motors and gas engines can be utilized for drives where required. Standard capacities of these cranes are up to 2,000 lb.

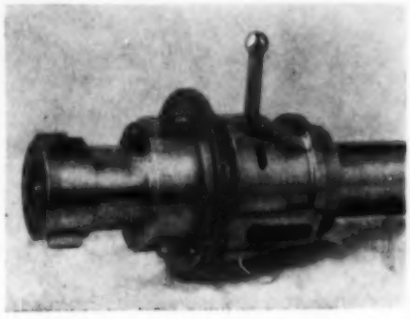
Geometric Special Combination Collapsible Tap

For cutting two diameters simultaneously, the Geometric Tool Company, New Haven, Conn., has developed a special combination collapsing tap. The tool illustrated is known as a 3-in. and 4-in. Class "SD" tap, being equipped to cut $3\frac{1}{16}$ in. 12 U.S.S. threads and $4\frac{3}{8}$ in., 12 U.S.S. threads at the same time. The chasers engage with the work simultaneously or at such pre-arranged points as necessary in order for the chasers to finish threading at the same time.

There are many possibilities for using a tap of this type. Its use, however, is limited by several factors. For example, the pitch of the two threads must be the same. Again, the two holes to be tapped must be far enough apart to permit the use of two sets of chaser slots and also two complete plungers for holding the chasers in the tool. Furthermore, the two holes should not be so far apart as to cause excessive overhang.

While the tool as shown is used in a stationary machine as a plate-trip, hand-reset type, nevertheless it has been used on a chucking machine as a rotary-tap plate-trip, automatic-reset type. Therefore, it may be said to have universal application such as found in the standard Class "S" taps.

The chasers of this tool have independent size adjustment, and those in the front are adjusted through the cap, while the back set is adjusted through the medium of adjusting ring located on the back of the body.



EQUIPMENT ADAPTATIONS

RECENTLY DEVELOPED BY THE MAKERS

▼

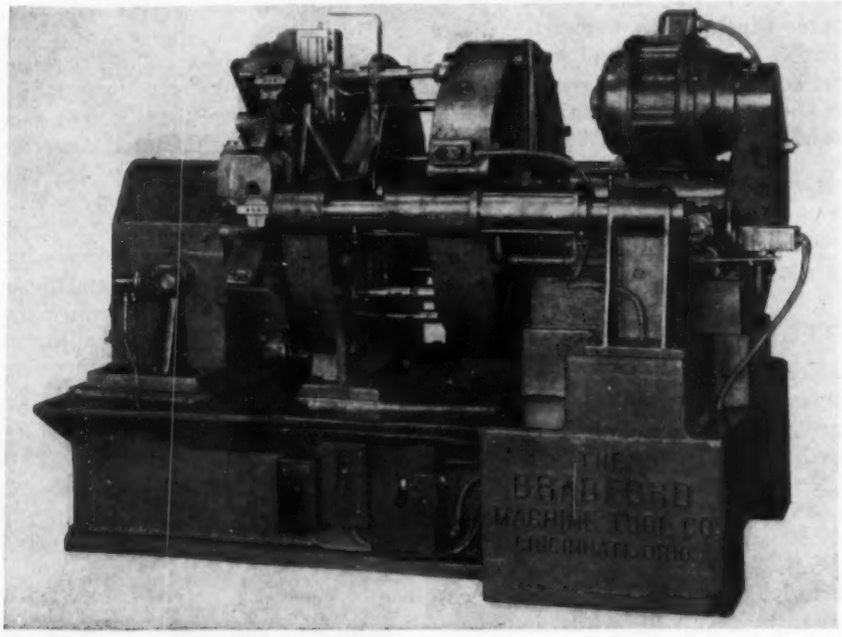
Bradford Automatic Machine with 8-Station Ferris-Wheel Drum

An automatic horizontal drilling machine has been developed by The Bradford Machine Tool Company, 657 Evans St., Cincinnati, Ohio, for drilling, taper reaming, and facing the end of the socket on a golf-club iron. This machine consists of a standard Bradford automatic drill unit equipped with a seven-spindle, multiple-spindle drillhead with the tools set at 45 deg. apart on a 24-in. circle. This drill unit is arranged to work in conjunction with an eight-station, ferris-wheel drum.

The fixture at each station consists of an equalizing two-jaw chuck, in which provisions are made for adjustments in six directions in order to compensate for variations in the different designs and sizes of golf-club irons, and also to take care of variations in the pitch of the irons and variations that may occur in the forging dies used for irons of the same style. Such multiplicity of adjustment makes it possible to handle every type of golf-club iron with a minimum loss of time for set up, and also the elimination of extra loose parts or adapters. The machine can be adapted to the production of any similar part requiring a multiple of

operations at one plane, the only change necessary being for the work-holding fixtures and the cutting tools.

Since all functions of the machine are fully automatic, the work of the operator is limited to loading and unloading. Control of the machine is centered in the motor operating the index movement. This motor is mounted at the back of the machine, and is connected to the index control by means of a spur gear and the worm gear drive rotating the control camshaft at a speed of 5.8 r.p.m. One second is required for the indexing movement, and the design of the cam is such that the acceleration and deceleration of the drum are accomplished without shock.



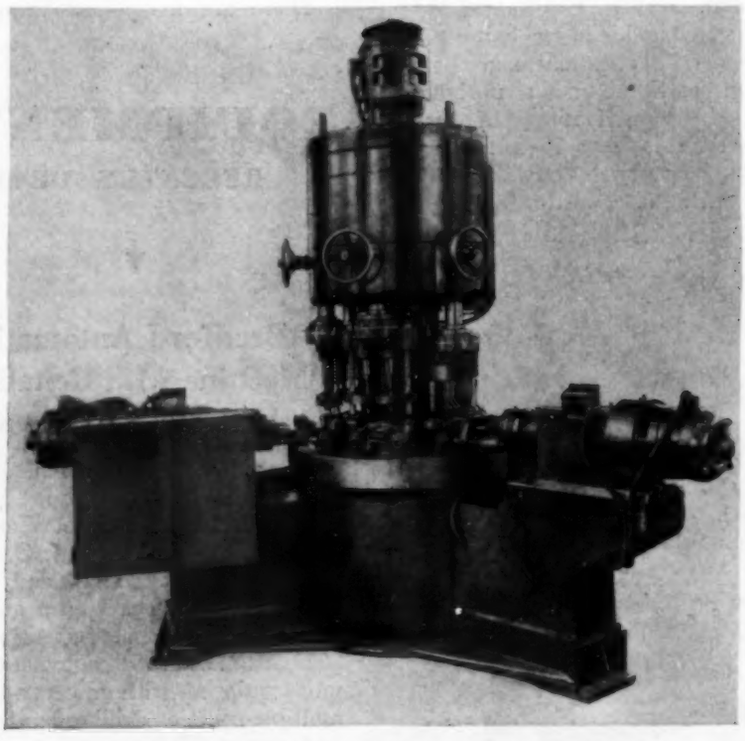
An 8-station ferris-wheel drum is built into this Bradford automatic machine for drilling, taper reaming, and facing golf-club irons

As the indexing movement is completed, an auxiliary cam on the camshaft actuates a single-acting air control valve at the left front of the machine. This valve causes the feed mechanism of the drilling unit to be thrown into engagement and the spindles to advance in rapid traverse for a distance of 2½ in., slow down to a feeding rate of 0.008 in. per revolution, and then return in rapid traverse to the starting point.

The machine is timed to operate on a cycle of 10½ sec., but the actual time required for loading and unloading the fixtures is less than six seconds. Consequently, the operator has ample time to inspect the work. The machine is equipped with a safety device so arranged that, in the event of the tools becoming excessively dull or unforeseen circumstances preventing the forward travel of the head, it will contact with the limit switch to stop the machine. The electrical control is centered in a single push button, but each motor is equipped with individual switches having underload and overload protection. When in operation, the ferris-wheel drum is totally inclosed with suitable splash guards.

Ex-Cell-O Vertical, Automatic Drilling and Tapping Machine

Instead of employing independently driven units mounted on vertical slides in the machine shown, the Ex-Cell-O Aircraft & Tool Corporation, 1200 Oakman Blvd., Detroit, Mich., uses a vertical unit having all vertical spindles contained therein driven by one motor. This is an improvement over the former type of design shown on page 305, Vol. 74, of *American Machinist*. The speeds of the vertical spindles may be changed by pick-off gears to suit the job, and they can be made adaptable to either multiple-head mounting or single-spindle mounting. This makes it possible to time accurately the cycle of each unit with relation to the others for handling different operations, such as drilling, tapping, reaming, and counterboring.



Special Ex-Cell-O machine for drilling, reaming, and tapping two holes at right angles. Each fixture takes two pieces

In the machine shown, all the units are equipped with multiple heads that provide from two to four spindles each. Each of these multiple heads is equipped with spring guide bars and bushing plates. The guide bars not only carry the bushing plates but also provide rigid alignment between the drillhead and the fixture as the work is indexed from one station to another.

Where required, this machine can be furnished with a five-station rotary

Bronze part drilled, reamed, and tapped in two holes at right angles, and with three holes drilled in the flange

table carrying suitable fixtures for holding the parts during the various operations. One station is for loading and the remaining four are work stations. Each fixture holds two parts. Four operations are performed by the vertical units and three by the horizontal units. The vertical operations consist of drilling reaming, and tapping a 15/16-in. hole and drilling three 13/64-in. holes in the flange of the part. The three horizontal units, of which two are shown, are for drilling, reaming and tapping the ½-in. hole at right angles to the large diameter of the part.

The base of the vertical unit contains the index mechanism and the motor for rotating the table. The entire cycle of the machine is electrically controlled by a system of relay switches mounted in a panel box and attached to the horizontal unit at the left. It is impossible to index the table while the spindles are in operation or to start the feed while the table is indexing.

On multiple operations where horizontal units are not required the machine can be furnished for handling vertical operations only. A control lever for starting and stopping the complete machine is conveniently located for the operator. A circulating lubrication pump carries oil to a reservoir at the top of the unit and distributes it to the various points of the mechanism contained within the housing.

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MARCH 24, 1931

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American Machinist

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New York, April 2, 1931

VOL. 74 NO. 14

Cut-and-Try Control

DISSOLUTION of the Bolt, Nut and Rivet Manufacturers' Association has been ordered by a Federal Court. Apparently, this action has been attended with an encouraging lack of recrimination and wasteful litigation. But, even so, we have in this case another example of unscientific business control. Why should it be necessary for a trade association to commit an illegal act before it can discover that the act in question is illegal? What a lot of expensive time would be saved if some means could be found to write an intelligible piece of legislation in the first place.

It may be lese majesty or some equally heinous traditional crime to question orthodox legal procedure, but as trade organizations become more and more powerful, and occasionally a bit unwieldy, business men are going to become less and less patient with legalistic hindrances to necessary and desirable economic action.

Banking Advice—1931 Model

HOW far the pendulum of human opinion can swing is demonstrated by comparing the advice of the present head of the American Bankers' Association, as of March, 1931, with the statements of equally prominent bankers in 1929. Then, the dear public was urged to put its money into such securities as aviation stocks, many of which depended for their value entirely on future prospects. Now, "business should cooperate with industry to avoid over-stocking, over-selling, or inveigling the public into committing itself for expenditures beyond its current purchasing power. Especially should it refrain from inveigling the public into habits of but half using the things it buys and hastily scrapping good values to seize catchy, new-fangled models."

Note the repetition of that unpleasant word "inveigling." Evidently this banker has not a very high opinion of his clients in business and industry.

Unfortunately for his sage advice it has been pretty conclusively proved that the public demands new products that are more efficient in performance, less expensive in price, or more attractive in appearance. "Inveigling" is not just the word to use.

And still more unfortunately, most of the bankers and financial men have not limited their strictures on expenditure to more or less ephemeral items. They have applied the same philosophy to purchases of modern production machinery.

Ask any production executive who is faced with the problem of reducing unit costs without the aid of up-to-date machinery what answer he gets from his directors or his bankers when he tries to spend money to save money. Even in the very largest corporations he is likely to run against the stone wall of absolute prohibition of any sort of capital expenditure.

It is hard to escape the feeling that banking advice, 1931 Model, is almost as ill-advised as were some of the statements issued by bankers in 1929.

Equipment for Aircraft Engines

THERE are indications of better times ahead for the aircraft industry. The period of depression has been very trying, but it has evidently been used to develop designs and to study the economical factors of production. Builders of aircraft engines have simplified design, construction, and manufacturing costs so that substantial reductions are possible, both for complete engines and for service parts, which are equally important.

Tools and fixtures have been made to secure interchangeable manufacture and to reduce costs. The return of business will doubtless result in the purchase of new machine equipment for utilizing these tools and fixtures to their best advantage. It may be wise to anticipate the return of aircraft business by lining up such new equipment as will be needed to build the increased output at a minimum cost, consistent with the required accuracy.

1—Long Term Planning of Business Operations

A—*Definitely abandon the yearly period as the basis for business operations, except in accounting matters.*

(1) Project business policies and planning, wherever possible, upon a three-year period or longer as a unit.

THERE have been four depressions of business in the present century, 1907, 1912, 1921, and 1930. These depressions have been purely artificial, and shortsighted industrial management must stand convicted of having been the cause of each one. Such an accusation does not imply a deliberate intent to bring them about, neither does it argue that management is inherently inefficient. Our preeminence as a manufacturing country proves the contrary.

Covering a single year, management is efficient; covering an extended cycle of years, it is helpless and impotent. This is testified to by the short time intervals between depressions.

That management does lack control over a long period is not an acceptable excuse, and the absence of a good excuse is seized upon by politicians as a pretense to advocate the appointment of a federal commission. People that habitually avoid work begin to demand relief, labor organizations seek to restrict output and reduce working hours; well-intentioned meddlers commence to advocate job insurance and doles.

On the other hand, it is not to be expected that a self-respecting and industrious people will continue to tolerate recurring disasters that deprive them and their families of the necessities of life, or take from them what they have saved during prosperous times. It is no longer possible to mislead the mass of people by blaming economic conditions on short crops or the party in power.

While management is accountable, it is not wholly to blame. It lacks control over long periods because it conducts its business and makes its plans on the basis of a single year. It makes its plans in terms of a single year because it has no mechanism for planning in perpetuity and no means of comparing conditions brought about by such plans. Management is blind and does not know it. It cannot or does not want to expose or visualize unfavorable conditions, consequently it does not hold its executives accountable for the errors for which they are responsible.

Twenty years ago, H. L. Gantt made the same charges of incompetency against management that we heard a nationally known accountant make, recently. Gantt held that there could be no relief from the general inefficiency of management until some method was devised whereby the results achieved by executives could be measured by the same rule that was used to measure the results achieved by the workman. Neither of these men was a theorist or a philosopher. Each was a practical man who made his living by management engineering. The accountant and the engineer are equally guilty with management, but they are neither accountable nor responsible. Responsibility lies with management alone.

Engineering and accounting are to blame in that —using figures that are symbols of definite quantities and values, that are a perfect basis of comparison, and that reduce the things they represent to a common denominator — they still cannot agree upon a uniform procedure. They can agree not even upon where things shall be charged nor in what proportions. The result is that an actual gain is transposed into an apparent loss to evade tax charges, while on the other hand, a liability is transposed into an apparent asset to cover up an error of judgment. With the aid of accounting, management robs future prospects to provide an unnecessarily good showing for the present.

There is an excuse for management because it is blind. It can neither compare, visualize, nor use a common denominator of valuation. Records are merely post mortems; real management should plan in terms of decades, not in terms of years. It should use records that mean one thing one year, and the same thing next year. The first step in permanent planning is real "honest-to-God" records that mean the same thing at all times.

NEWS OF THE WEEK

American Machinist's new London offices in Aldwych House, Aldwych, London, W.C.2. A cordial welcome awaits any readers visiting England

Semi-Annual Meeting Program Announced by A.S.M.E.

THE final program of the 1931 Semi-Annual Meeting of the American Society of Mechanical Engineers, to be held at Birmingham, Ala., April 20-23, has been announced. Sessions include those on Processes, Iron and Steel, Hydraulics, Safety, Railroads, Fuels, Petroleum, Textiles, Power, and Materials Handling. The feature session will be held on Tuesday evening and will be addressed by H. C. Ryding, President of the Tennessee Coal, Iron & Railroad Co., on "The Principles of Industrial Plant Location," and by F. G. Coburn, President of the Aviation Corp., on "Air Transport."

The sessions are all concentrated on Monday and Tuesday so that Wednesday and Thursday may be devoted to excursions. On Tuesday afternoon, plans adjacent to Birmingham will be open for inspection, while the principal excursions of the meeting are scheduled for Wednesday and Thursday. Papers include "Cast-Iron Pipe Produced Centrifugally by the deLavaud Process"; "New Mono-Cast Centrifugal Pipe Plant"; "Economic Aspects of Accident Prevention in the Iron & Steel Industry"; "Accident Prevention Through Safety Engineering"; "Practical Application of Alloy Steel to Locomotives"; "Theoretical Application of Alloy Steel to Locomotives"; "Design Features and Operating Results of Fairfield Blast Furnace Power Plant"; "Mold-Handling Methods in Foundries"; "Machine-Shop Handling"; "Preparation and Distribution of Molding Sands"; "Principles of Industrial Plant Location."

The A.S.M.E. Applied Mechanics Division will also hold its First National Meeting at Purdue University on June 15 to 16. J. M. Lessells, Secretary, Applied Mechanics Division, has announced a session on "Stress Analysis and Plasticity." In the evening there will be a dinner. Tuesday there will be sessions on Vibration and Hydrodynamics with a special session Tuesday evening showing a number of research film studies. Papers are being prepared on "Photoelastic Analysis of Rectangular Blocks," "Thermal Stresses in Cylinders," "Center of Torsion for Angle and Channel Sections," "Creep of Metals in Twist, Compression, and Bending of Corrugated Pipes," "Mechanics of Yield Point," "Forced Vibration with Combined Coulomb and Viscous Friction," "A New Balancing Machine," "Noise Prevention Through Elastic Suspension," "Some Critical Speeds of Rotating Shafts," "Propeller-Type Fans," and "Jets from Manifold Tubes." The following day, June 17, will be held open for participation in the conference of the Applied Mechanics Section of the Society for the Promotion of Engineering Education, which is holding its annual meeting at Purdue starting June 17.

C. R. Burt

Mechanical engineers of New England are co-operating in a meeting to be held at Hartford on June 1, 2, and 3, under the leadership of the Hartford Committee, with C. R. Burt as chairman. The technical program has been arranged in tentative form and includes sessions on Machine-Shop Practice, Power, Aeronautics, Management, Applied Mechanics, Materials Handling, Textiles, and Mechanical Springs.

Social Economic Planning World Congress Subject

A world industrial relations congress on "Social Economic Planning—The necessity for planned adjustment of productive capacity and standards of living" is announced by the International Industrial Relations Association. The congress, the first of its kind, will be held at Amsterdam, Holland, during the last week of August of this year. All proceedings will be conducted in English, French, and German. The complete program and further information may be obtained from the vice-president in the United States, Miss Mary van Kleeck, Director of Industrial Studies, Russell Sage Foundation, 130 East 22nd St., New York, N. Y

A.F.A. Convention and Exhibit Scheduled in Chicago

ALL activities of the 34th Annual Convention of the American Foundrymen's Association will be centered in the Stevens Hotel, Chicago, from May 4-7. Exhibit accommodations will include the Exhibition Hall and the Grand Ballroom, considerably more space than was available there at the 1928 meeting. Papers to be presented at the technical session cover a wide range of subjects, dealing with all major phases of metal founding. A considerable part of the 4-day program will be devoted to discussion of problems relating to specific types of cast metals, but several general sessions will also be held including those on sand control, pattern production, costs, and apprentice training. The non-ferrous program will include a shop-operation course of three sessions, a round-table discussion group, a session on cost methods, and two sessions on plant and metallurgical methods. Steel founders will have a 3-session shop-operation course, a round-table discussion group, and two sessions on technical subjects. The malleable iron division will have its initial shop-operation course, also a round-table luncheon meeting and a session on metallurgical phases of malleable production. A shop-operation course on gating, heat-treatment, and high-test cast irons, and three sessions of papers on metallurgical and shop-operation problems will be included in the gray iron program.

A partial list of the papers includes:

STEEL CASTINGS

"Chemical Composition as Employed for Classifying Carbon and Alloy Steels for Casting," by Maj. R. A. Bull, Electric Steel Founders' Research Group.

"Some Metallurgical Points on Acid Open-Hearth and Electric Steel for Castings," by F. A. Melmoth, Detroit Steel Casting Co.

"Centrifugal Casting of Guns," by Col. T. C. Dickson, Watertown Arsenal.

"A Comparison of Synthetic and Natural Bonded Molding Sands for Steel Foundries," by H. J. Cole, General Electric Co.

"Interrelationship of Pine-Hole Trouble and Low Ductility Problems," by Geo. Batty, Steel Castings Development Bureau.

MALLEABLE IRON

"Thermal Balances of Malleable Melting Furnaces and Production Costs," by J. H. Hruska.

"High Tensile Materials," by Dr. Anson Hayes, American Rolling Mill Co.

"Report on Malleable Furnace Refractories," by J. R. Allan, International Harvester Co.

FOUNDRY COSTS

"Weak Points in Cost Systems Which Permit Leakages," by E. A. Baker, Ellery A. Baker & Co.

Report of Committee on Required Estimating Data.

Report of Committee on Methods for Estimating Molding Costs.

APPRENTICE TRAINING

"Getting a Community Apprenticeship Program Under Way," by H. S. Falk, Falk Corporation.

"Related Instruction," by S. M. Brah, Tri-City Manufacturers' Assn.

SAND RESEARCH AND CONTROL

"Effect of Heat on the Permeability of Facing and Core Sands," by W. M. Saunders.

"Shape of Sand Grains," by Dr. H. Ries and G. C. Conant, Cornell University.

"Some Observations on the Use of Synthetic Sands," by L. B. Knight, National Engineering Co.

"Relation Between Sand Grains and Strength of Sands," by Dr. H. Ries and H. V. Lee, Cornell University.

NON-FERROUS FOUNDRY PRACTICE

"Deep Etching of Brass as Applied to Gating Problems," by R. W. Parsons, Ohio Brass Co.

"Cupola Melting of Brass," by T. Mauland, International Harvester Co.

"Permanent-Mold Foundry Practice for Brass and Bronze Castings," by Henri Marius, Lenoir Car Works.

"Molding Practice for Heat-Treated Aluminum-Alloy Castings," by L. H. Fawcett, U. S. Naval Gun Factory.

"The X-Ray as a Tool for Improving Aluminum-Alloy Foundry Practice," by H. J. Rowe and E. M. Gingerich, Aluminum Co. of America.

"Bronze Pressure Castings," by J. E. Crown, U. S. Naval Gun Factory.

GRAY IRON

"An Inclusion in Cast Iron and Its Relation to Manganese and Silicon Content," by F. J. Cook, England.

"The Microscope as a Tool in Investigating Cast Iron," by R. M. Allen.

"Gating," by Max Kuniansky, Lynchburg Foundry Co.

"A Contribution to the Study of the Part Played by Phosphorus in Cast Iron," by J. Dessent and M. Kagon, Liege, Belgium. (Exchange paper of the Belgian Foundry Technical Association.)

"Factors Which Influence the Surface Quality of Gray Iron Castings," by W. G. Reichert and D. Woolley, Singer Manufacturing Co.

"Effect of Atmospheric Moisture on Cupola Operation," by N. A. Moore, Piston Ring Co.

"Electric-Process Iron for Cylinder and Cylinder-Head Castings," by H. E. Bromer, Standard Foundry Co.

"Melting Gray Iron and Malleable Iron in the Indirect-Arc Furnace," by J. H. Vogel and J. C. Bennett, York Ice Machinery Co.

"Testing Cast Iron," by Major Nicalau, Paris, France. (Exchange paper of French Foundry Technical Association.)

"Manufacture and Use of Cupola High-Test and Alloy Irons in Machine Tool and Jobbing Foundry," by L. M. Sherwin and T. F. Kiley, Brown & Sharpe Manufacturing Co.

Navy Adopts Boiler Welding

After being satisfied that methods are available by which it is practicable to make inspection tests of welds, the Bureau of Engineering of the Navy Department has decided to use electric welding on the main boiler drums of four of its new 10,000-ton cruisers now under construction. Previously, naval officers have hesitated to make extensive use of electric welding because of the difficulty in making non-destructive tests of the completed weld. Now, however, it is believed that by making X-ray plates of each inch of the weld and by magnetic analysis, it will be possible to make a satisfactory test without damaging the work.

Tiering trucks are now being used to change heavy automotive die assemblies. This 13,000-lb. Elwell-Parker gas-electric truck is carrying a 15-ton assembly. Load lifting is done by a winch which can also be used for loading and unloading the assembly

STUDIES in technological unemployment are under way at Purdue University under the auspices of the American Engineering Council. The inquiry, dealing with the displacement of workers by machines, aims to measure the influence of science and invention on the business cycle, and to point the way to economic adjustment.

"RATIONALIZATION of German Industry," a report just published by the National Industrial Conference Board, gives the complete story of the "rationalization" movement in Germany, from the standpoint of the economist and industrialist. One chapter is devoted to an analysis of the cartel or combine system in the steel industry.

Machinery and Tool Exports Continue Upturn in February

PAUL WOOTON
Washington Correspondent

WASHINGTON, D. C., March 30—There was an upturn in the value of exports in the machinery group in February, returns to the Department of Commerce show. All exports included in that group were valued at $61,665,255, as compared with $54,103,509 in January, and $53,468,385 in December. This is 18 per cent above the monthly average for the last six months of 1930. The total, however, is nearly $20,000,000 less than the value of exports in February, 1930. The major sub-divisions of the group, with comparative figures for February, 1930, and for January, follow:

	February, 1930	January, 1931	February, 1931
Electrical machinery	$10,177,471	$7,042,923	$6,533,772
Industrial machinery	20,533,902	15,089,853	12,953,584
Construction machinery	2,099,446	994,522	785,236
Mining machinery	5,760,286	4,443,885	2,122,409
Textile machinery	1,736,165	1,136,802	1,031,112
Sewing machines	736,278	392,269	350,978
Shoe machinery	138,146	112,840	69,793
Other industrial machinery	6,163,628	4,409,501	4,010,731

The one strong item in the whole machinery group is power-driven metal-working machinery. In February, equipment under that sub-division was exported to a value of $3,678,661. This is $736,650 more than the value of exports in February, 1930, and $911,731 more than exports in January of 1931. Detailed figures follow:

	February, 1930 Quantity	February, 1930 Value	February, 1931 Quantity	February, 1931 Value
Engine lathes	95	$209,961	43	$99,636
Turret lathes	34	111,568	14	34,739
Other lathes	45	100,151	69	144,614
Vertical boring mills and chucking machines	24	58,661	14	21,967
Thread-cutting and automatic screw machines	69	105,254	18	21,729
Knee and column type milling machines	27	57,456	4	6,414
Other milling machines	51	76,514	9	19,394
Gear cutting machines	20	94,532	52	65,309
Vertical drilling machines	119	97,814	27	139,737
Radial drilling machines	11	20,950	6	11,347
Othr drilling machines	187	229,197	530	300,328
Planers and shapers	16	30,911	14	20,989
Surface grinding machines	32	51,758	12	20,899
External cylindrical grinding machines	33	76,020	23	96,359
Internal grinding machines	89	200,507	69	267,633
Tool grinding, cutter grinding and universal grinding machines	114	70,350	63	44,150
Other metal grinding machines	..	62,676	..	47,772
Sheet and plate metal-working machines	..	251,029	..	341,393
Forging machinery	..	171,417	..	425,756
Rolling mill machinery	..	29,202	..	136,743
Foundry and molding equipment	..	364,684	..	85,235
Other power-driven metal-working machinery and parts	..	471,399	..	1,326,518

Thirty-Fourth Annual Meeting Scheduled by A.S.T.M.

THE Thirty-Fourth Annual Meeting of the American Society for Testing Materials is scheduled at the Stevens Hotel, Chicago, Ill., from June 22 to 26. Several of the technical sessions are of the nature of joint meetings with other societies. This is true of the two technical sessions comprising the Symposium on Effect of Temperature on the Properties of Metals, arranged with the co-operation of the A.S.M.E. The Symposium on Malleable Castings also is being arranged under the joint auspices of the A.F.A. and the A.S.T.M. An additional feature will be a joint meeting with the Western Society of Engineers at which there will be discussed the significance of specifications in certain major industries of the Chicago District. In addition, for the first time, an Exhibit of Testing Apparatus and Machines is being held in conjunction with an annual meeting of the A.S.T.M. Papers presented at the 1930 Annual Meeting have been reviewed by a special committee and the fourth award of the Charles B. Dudley Medal will be made to the author or authors of a paper of outstanding merit constituting an original contribution on research in engineering materials. The Edgar Marburg Lecture will be on "The Phenomenon of Slip on Plastic Materials" and will be given by Dr. A. Nadai, Research Engineer of the Westinghouse Electric & Manufacturing Co.

The first exhibit of testing apparatus and machines will be held in the Exhibition Hall of the Hotel Stevens, covering equipment for practically every kind of test, including determination of chemical composition of materials and physical constants, mechanical properties and electrical, magnetic, thermal, and metallographic properties.

A number of reports of committees were given at the Annual Spring Group Meeting of Committees of the Society in Pittsburgh on March 16 to 20. Committee A-1 on Steel reported through a sub-committee that there have now been prepared specifications for five different types of piping, including riveted, lock-bar, hammer welded, electric resistance welded, and electric fusion welded pipe. It is expected that the specifications will be in suitable form for recommendation for approval some time early in the summer. Also, a new proposed tentative specification for Normalized and Tempered Alloy Steel Forgings for Locomotives has been prepared. Revisions have also been made in the tentative specification for Carbon-Steel Forgings for Locomotives. A new sub-committee on Automotive Castings has been formed under the chairmanship of A. L. Boegehold of the General Motors Corporation, to consider specifications and problems pertaining to automotive grey iron castings. A new sub-committee of Committee E-4 on Metallography has been formed to study grain sizes in steels and to prepare photomicrographs that cauld be used as standards of comparison.

S.A.E. Lists Program For Production Meeting

This year's Spring Production Meeting of the Society of Automotive Engineers will be held under the auspices of the Milwaukee Section at the Hotel Schroeder, Milwaukee, on May 7 and 8. The program opens with registration Thursday morning and a technical session under the sponsorship of the National Production Activity Committee that afternoon. Two papers will be presented. The first is "The Use of Power-Driven Industrial Trucks in the Handling Systems of Automotive and Automotive Accessory Plants," by C. B. Crockett of the Industrial Truck Association, and the second is, "Nickel Alloys in Automotive Manufacturing," by T. H. Wickenden of the International Nickel Co. The evening session will be a feature by the Milwaukee Section.

Friday morning's program begins with a technical session under the sponsorship of the Milwaukee Section with a paper, "New Developments in Surface Hardening of Steel and Their Effect on Cost of Production," by H. E. Koch of the Hevi-Duty Electric Co., and later a demonstration at the plant of the Hevi-Duty Electric Co. The afternoon's program also has two parts, first a paper "Latest Developments in High-Speed Milling with Tantalum and Tungsten-Carbide Cutters," by F. W. Curtis of the Kearney & Trecker Corporation, and second, a demonstration at the plant of the Kearney & Trecker Corporation. That evening at 6:30, the Milwaukee Section Production Dinner will be held, with H. L. Horning, President of the Waukesha Motor Co., as toastmaster and Dr. E. A. Ross, Professor of Social and Political Science of the University of Wisconsin, as speaker.

"STABILIZING Metal Trades Employment" is the title of a booklet just issued by the Committee on Industrial Relations of the National Metal Trades Association. This report, made up of three sections, first describes the field in which the study was made, second the facts revealed in its course and their discussion. The third represents the conclusions reached by this Committee after careful interpretation.

£1,000,000 Soviet Order For Great Britain

By Our English Correspondent

Sol. G. Bron, trade representative of Soviet Russia in Great Britain, has issued the following statement in conjunction with Greville Maginness, Chairman of the Associated British Machine Tool Makers, Ltd.: "In view of the very satisfactory manner in which the agreement signed on Nov. 17, 1930, between S. G. Bron and Greville Maginness was carried out, it has been decided to extend the original agreement, for an amount of £600,000 for the supply of machine tools to the U.S.S.R. to £1,000,000, with provision for further extension."

It is believed that this is the largest contract ever entered into in Great Britain for machine tools with any single buyer. The Association extends to the trade delegation on this supplementary agreement credit on similar lines to those provided for in the original contract.

Metal Exposition Plans Mailed

Plans for the 13th Annual Metal Exposition have been mailed, according to a recent announcement by W. H. Eisenman, Secretary of the American Society for Steel Treating. The exposition will be held this year in Boston, at the Commonwealth Pier, during the week of Sept. 21. According to Mr. Eisenman, the Commonwealth Pier is an unusually good location for a show of the size of the National Metal Exposition because of the large amount of floor space, good ventilation, and accessibility of the pier to downtown Boston. Attendance at the exposition is expected to be well in excess of 60,000, while registration at the technical sessions of the Congress will probably run over 6,000. As usual, the American Society for Steel Treating has the co-operation of the following societies as joint sponsors of the National Metal Congress: American Welding Society; the Iron and Steel and the Institute of Metals Divisions of the American Institute of Mining and Metallurgical Engineers; the Iron and Steel and the Machine Shop Practice Divisions of the American Society of Mechanical Engineers, and the Gas Products Association.

Bolt, Nut & Rivet Men Promote Employment

Organizing to promote employment measures within its ranks, the bolt, nut, and rivet industry has appointed a special committee to formulate stabilization plans, according to a statement received by Colonel Arthur Woods, Chairman of the President's Emergency Committee for Employment, from Charles J. Graham, President of the Bolt, Nut, and Rivet Manufacturers' Association. "In response to suggestions by the President's Emergency Committee," says Mr. Graham, "the following have been named to co-operate with Colonel Woods' group: J. P. Hoelzel (Chairman), Vice-President, Pittsburgh Screw & Bolt Corporation; Evans Ward, Vice-President, Russell, Burdsall & Ward; and N. T. Jones, President, Superior Screw & Bolt Manufacturing Co."

Westinghouse to Salute Machinery Builders

The theme of the April 26 radio program of the Westinghouse Electric & Manufacturing Co. over a group of 25 radio stations associated with the National Broadcasting Co., will be a salute to machinery builders. The theme will be based on the steps which have been made, and are being made, in the use of machinery. Carl A. Johnson, President of the National Machine Tool Builders' Association, will be the guest speaker.

AN OPEN competitive examination for the position of junior laboratory mechanic has been announced by the U. S. Civil Service Commission. Applications must be on file with the Civil Service Commission in Washington, D. C., not later than April 8.

THE February trade report of the Gray Iron Institute shows a 3 per cent increase over January, which in turn showed a gain over December. The February report is the first in eight months in which an increase is shown in all three important items, Production, New Business, and Unfilled Orders. The Middle West-Southern territory shows a sharp gain as does the Chicago district. Factories in the 1 to 100 tons per month class showed the greatest gain.

RECENT simplified practice recommendations issued to manufacturers, distributors, and users by the Department of Commerce include No. 17 on Forged Tools. This is a report of the second revision conference at Pittsburgh on Feb. 17. Another is R60-30 on Packaging of Carriage, Machine, and Lag Bolts. Copies of both are available from the Superintendent of Documents, Washington, D. C.

BUSINESS ITEMS

A new corporation, to be known as the Penn Heat Control Co., in which the General Electric Co., has a controlling interest, has been formed to take over all assets, including patents and good will, of the Penn Heat Control Corporation, Philadelphia. The new corporation will retain the personnel and organization of the former company.

The Canadian branch of the Yale & Towne Manufacturing Co., which some time ago bought the assets and good will of the Steubing Cowan Co., Cincinnati, Ohio, is installing additional manufacturing facilities at St. Catherines, Ont., for the production of Steubing equipment. For some years past this has been manufactured and sold in Canada under license by the Canadian Lift Truck Co., Montreal and Toronto. This manufacturing arrangement will continue for the present.

N. A. Woodworth
Now President
Ex-Cell-O Aircraft & Tool Corporation

The Norge Corporation has incorporated a Canadian subsidiary, the Norge Corporation of Canada, Ltd., with offices at Toronto, Ont. Both companies are subsidiaries of the Borg-Warner Co., Chicago.

The Shepard Niles Crane & Hoist Corporation has moved its Pittsburgh sales office to the Grant Bldg., Rooms 1524 to 1525. Roy M. Hurst, until recently in the New York office, will be district manager. Frank J. Kinney, who has represented the company for many years in the Pittsburgh territory, will be associated with Mr. Hurst. The Cleveland sales office has been changed to 1433 East 12th Street and Harry A. Baugh will be district manager. Mr. Baugh was previously in the Chicago office.

Following the merger of the Victor Welding Equipment Co. with the Kimball-Krogh Pump Co., to form the Victor Equipment Co., the following official personnel has been elected: President, L. W. Stettner, formerly president of Victor Welding Equipment Co.; vice-president, E. L. Mathy, formerly vice-president of Victor Welding Equipment Co.; secretary, W. S. Fulwider, formerly secretary of the Victor Welding Equipment Co. Headquarters of the new company will be maintained at 844 Folsom St., San Francisco.

A Dominion charter has been issued incorporating the Jones Shovel Co. Ltd., with head office at Gananoque, Ont. Capital structure is 15,000 no par value shares. These are not to exceed $500,000 in the aggregate. The company is empowered to do business as brass and iron founders; manufacturers and rollers of steel and iron; tin plate makers, etc.

The Geometric Tool Co., New Haven, Conn., has appointed J. C. Ross & Co., 2207 First Ave., South, Seattle, Wash., as exclusive selling agents in the States of Washington and Oregon.

The Raydon Manufacturing Co., 53 Hanover St., Boston, Mass., has succeeded the Blake Process Machinery Co., in the manufacture of thermographic supplies.

The Tabor Manufacturing Co., 6225 Tacony St., Philadelphia, has opened a sales office in Detroit, Mich., at 2842 West Grand Boulevard.

The Spencer Thermostat Co., has recently moved to Attleboro, Mass.

The Jones & Laughlin Steel Corporation has purchased the Lukens Steel Co. plant at New Orleans, La.

PERSONALS

Frederick J. Haynes, Vice-President and General Manager of the H. H. Franklin Manufacturing Co., Syracuse, N. Y., has assumed personal charge of all departments of manufacture following the resignation of L. J. Purdy, Factory Manager. Frank J. Leyerle has been appointed Mr. Haynes' assistant in the direction of factory operations. Mr. Leyerle has been connected with the company for the past ten years. Mark Harris, for the past 2½ years manufacture and research engineer, has resigned.

Harrington Emerson, founder of the Emerson Engineers, 30 Church St., New York, was recently presented with a certificate of honorary membership in the Masaryk Academy of Czechoslovakia, at a luncheon in his honor at the Engineers' Club, New York. Dr. Jaroslav Novak, Consul General of Czechoslovakia in New York, made the presentation.

H. D. Bennett, President of the Toledo Scale Manufacturing Co., Toledo, Ohio, was elected treasurer also at a recent meeting of the board of directors. C. O. Marshall was elected secretary. William Zolg, formerly secretary-treasurer, died recently.

N. L. Howard, formerly president of the Chicago, Great Western Railroad, has been elected chairman of the board of the North American Car Corporation, Chicago. The chairmanship is a newly created position.

George W. H. Allen has been made a director of the American Locomotive Co., New York.

Frank A. Atcheron, Manager of the Ford Motor Company's branch plant at Charlotte, N. C., has been transferred to St. Louis as manager of the branch plant there.

O. J. Ashman has been elected president and general manager of the Relay Motors Corporation to succeed G. L. Gillam resigned.

D. M. Bigge, formerly vice-president and general manager of the Panyard Piston Ring Co., Muskegon, Mich., has been made president and general manager to succeed P. P. Schnorbach.

Thomas J. Litle, Jr., Consulting Engineer of Detroit, has been elected

vice-president and director of the Holley Carburetor Co., in addition to his consulting practice.

P. A. Collins has been appointed experimental engineer of the Olds Motor Works, a division of the General Motors Corporation. He was formerly with the Muncie Products Division of General Motors, as an executive since June, 1930.

L. M. Dunning has been advanced to sales representative of the Chicago office, and Herbert A. Holmes has been advanced to sales representative of the Pittsburgh office, of the Reliance Electric & Engineering Co., Cleveland.

C. M. Emerson has joined the New York office at 50 Church St. of the Alan Wood Steel Co., Conshohocken, Pa.

Charles G. Frances, formerly general superintendent of the Cunningham Motor Car Co., Rochester, N. Y., has been appointed general works manager of the Dittmer Gear & Manufacturing Corporation, Lockport, N. Y.

R. O. Gill has been elected president and general manager of the American Austin Car Co.

R. O. Gill has been elected treasurer of the Hayes Body Corporation, Detroit, to succeed A. A. Anderson, who is now secretary and assistant treasurer. W. Johnson has been elected a director to succeed the late Dudley E. Waters.

Harry W. Kranz, President of the Cleveland Welding Co., control of which was purchased by the Motor Wheel Corporation, Lansing, Mich., last year, has been added to the board of directors of Motor Wheel Corporation.

J. P. Powell, Assistant Engineer of the General Electric Co., will speak on "Photo-Electric Cells and Their Application to Machine Control" at the April 23 meeting of the Waterbury Local Section, A.S.M.E.

Ben O. Isom has rejoined the Hutto Engineering Co., Detroit, as factory representative in the Chicago and Michigan territories, working with the Charles A. Strelinger Co., Detroit, and W. T. Bittner, Chicago. Mr. Isom was for several years with the Hutto Engineering Co., but left in September, 1930, to join the Micromatic Hone Corporation.

J. B. MacNeill has been appointed general manager of Distribution Engineering for the Westinghouse Electric & Manufacturing Co., East Pittsburgh. He will co-ordinate the engineering activities on switchboards, circuit breakers, meters, relays, high tension insulators and lightning arresters. T. S. Perkins has been named manager of Merchandising Engineering to represent S. M. Kintner, Assistant Vice-President, in his work with supply, appliance, refrigeration, and illuminating engineering department service.

Stanley H. McKee, formerly chief engineer of the Republic Steel Corporation, Youngstown, Ohio, and C. G. Jones, formerly identified with the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., have been made special engineers by the Youngstown (Ohio) Sheet & Tube Co.

A. A. Motherwell, formerly in charge of forging plants for the General Motors Corporation at Detroit and Flint, Mich., until his retirement five years ago, has re-entered the forging business, becoming associated with the Standard Forgings Co., Chicago. He will devote his time to problems in connection with the manufacture of automotive forgings.

Guy M. Peterson, formerly vice-president of the Cheney Bigelow Wire Works, Springfield, Mass., has been elected president and treasurer. New directors include Roe S. Clark, Roger L. Putnam, and Paul E. Kyburg of the Package Machinery Co., Springfield, Mass.; Harry C. Beaver of the Worthington Pump & Machinery Co., and L. B. Howe. Ralph E. Freeman and Roger G. Edwards have been elected vice-presidents.

John A. Mair has been appointed field engineer of the Buffalo plant of the Worthington Pump & Machinery Corporation, Harrison, N. J. Anthony F. Beres has been made personnel manager.

William F. Wise
Vice-President in charge of sales
Ex-Cell-O Aircraft & Tool Corporation

H. R. Krueger
Vice-President in charge of engineering
Ex-Cell-O Aircraft & Tool Corporation

Edward C. Gainsborg has become sales manager of the Industrial Division, Roller Bearing Co. of America, Trenton, N. J. He was formerly with SKF Industries for 10 years.

W. Ray Moore has been appointed general sales manager of the Billings & Spencer Co., Hartford, Conn. He has been with the company continuously for 17 years.

Frank Ness has been appointed manager of the Barber-Greene Co. of Philadelphia, and D. H. McLean, manager of the Barber-Greene Co. of Cleveland, by the Barber-Greene Co., Aurora, Ill.

Harold H. Perry has resigned as vice-president and director of the Industrial Brownhoist Corporation, Cleveland, and Bay City, Mich., to become an executive in an Illinois equipment concern.

A. L. Rose, Manager of Sales for the Detroit (Mich.) Forging Co., has resigned, and will be succeeded by George B. Reed.

Arthur H. Senior has been appointed traffic manager of the Union Drawn Steel Co., Beaver Falls, Pa., succeeding the late Arthur W. Boyd. Mr. Senior became associated with the Union Drawn Steel Co., in 1924 and has served as assistant traffic manager since 1928.

Earl H. Smith, formerly experimental engineer for Oldsmobile, has joined the Oakland Motors staff in an engineering capacity. He joined Oldsmobile in 1925 as an inspector and became experimental engineer in 1927.

OBITUARIES

Beverly L. Worden, 60, President of the Cutler-Hammer Manufacturing Co., New York and Milwaukee, died in West Orange, N. J., on March 28, after an illness of several months.

Andrew Allen, 61, President of the Allen & Garcia Co., Chicago, died March 21 in Jasper, Ala.

John Boswell, 55, Superintendent of the American Car & Foundry Co., Granite City, Ill., died recently there.

Charles A. Bumpus, 80, President of the Cobb & Drew Tack & Rivet Co., Plymouth, Mass., died March 23. He had been connected with his company for 60 years. In 1918 he became treasurer, and in 1920 was elected president.

William G. Clyde, 62, former president of the Carnegie Steel Co., Pittsburgh, Pa., died March 23 in Pittsburgh. He had resigned last September owing to failing health, after serving for four years.

John A. Condo, 52, who for the past 34 years has been identified with the Mutual Wheel Co., Moline, Ill., died March 13 at Rock Island, Ill.

Oliver Evans, 50, Production Manager for the Standard Tin Plate Co., Cannonsburg, Pa., died March 22.

Francis G. Hitchins, 65, for 39 years vice-president of the Headford Bros. & Hitchins Foundry Co., Waterloo, Iowa, died recently there.

Daniel J. Kilby, 60, co-founder with his father of the Kilby Manufacturing Co., Cleveland, died March 17.

George R. Metcalfe, Sr., 73, Chairman of the Board of the Erie (Pa.) Malleable Iron Works Co. since 1928, died March 23 in Erie, following a brief illness.

William V. Orr, 54, Vice-President of the Apex Electrical Manufacturing Co., Cleveland, died March 22 in Cleveland Heights, after an illness of five weeks.

George L. Pettibone, 55, of the Rock Island (Ill.) Plow Co., died March 13.

Edward Dwight Priest, 70, veteran designing engineer in the railway department of the General Electric Co., Schenectady, N. Y., and chairman of the board of the Parker Wire Goods Co., Worcester, Mass., died in Schenectady, March 26. He had retired in 1926 after having been with the company since 1892.

William Marcelin Scaife, 64, President and a director of the Airtight Steel Tank Co., Sewickley, Pa., died March 26, after an operation.

John H. Short, 50, Secretary of the Garland Manufacturing Co., Pittsburgh, died March 17.

L. E. Waite, 55, Manager of the Wheel Division of the Erie Malleable Iron Co., for the past five years, died in Erie recently, following a lingering illness.

Abraham Weber, 56, holder of large interests at one time in the Pitanium Bronze Co., the Giant Truck Co., King Motor Car Co., and other corporations in Buffalo, N. Y., died March 20.

Robert Woodward, 88, formerly chairman of the board of Edgar Allen & Co., Ltd., Sheffield, England, died recently.

J. Lewis Wyckoff, 67, President of the White & Wyckoff Co., Holyoke, Mass., died March 19.

FORTHCOMING MEETINGS

Three-M-Congress — Management, Maintenance, and Materials Handling Congress and Second National Industrial Equipment Exposition, Cleveland, Ohio, April 13-18, 1931. In the Arena and Exhibit Hall, Cleveland Public Auditorium. Information from the A.S.M.E., 29 West 39th St., N.Y.C.

American Society of Mechanical Engineers—Calvin W. Rice, executive secretary, 29 West 39th St., New York. The following meetings are scheduled:

Semi-Annual meeting, Birmingham, Ala., Apr. 20-23, 1931.
National Aeronautic Meeting, Baltimore, Md., May 12-14, 1931.
National Applied Mechanics Meeting, Purdue University, Lafayette, Ind., June 15-16.

American Welding Society—Annual Meeting, April 22-24, New York City. M. M. Kelly; 33 West 39th St., New York, Secretary.

Steel Founders' Society of America — Monthly Meeting, Pittsburgh, April 23. Granville P. Rogers, 432 Graybar Bldg., New York City, Managing Director.

American Foundrymen's Association—Annual convention and exhibition, Stevens Hotel, Chicago, May 4-8, 1931, C. E. Hoyt, 222 West Adams St., Chicago, secretary.

Society of Automotive Engineers—Annual Spring Production Meeting, May 7-8 at Hotel Schroeder, Milwaukee. J. A. C. Warner, 29 West 39th St., New York, N. Y., Secretary.

American Gear Manufacturers' Association—Annual Spring Meeting, Hotel Statler, Buffalo, May 7-9, 1931. T. W. Owen, 3608 Euclid Ave., Cleveland, secretary.

American Steel & Heavy Hardware Association — Twenty-second Annual Convention, May 18-20, William Penn Hotel, Pittsburgh. B. R. Sackett, 505 Arch St., Philadelphia, Secretary-treasurer.

National Foreign Trade Council—Annual Convention, May 27-29, at the Hotel Commodore, New York City. O. K. Davis, secretary, 1 Hanover Square, New York, N. Y.

American Management Association—Annual Conference, Production Division, Rochester, N. Y., June 1-2. Headquarters, 20 Vesey St., N. Y. C.

National Association of Purchasing Agents—Annual Convention and Informashow, Royal York Hotel, Toronto, Canada, June 8-11. G. A. Renard, Secretary-Treasurer, 11 Park Place, New York.

American Society for Testing Materials—Annual Meeting, Stevens Hotel, Chicago, June 22-26. C. L. Warwick, 1315 Spruce St., Philadelphia.

American Institute of Electrical Engineers—Annual Summer Convention, June 22-26, Asheville, N. C. F. L. Hutchinson, 33 West 39th St., New York, N. Y., secretary.

THE INDUSTRIAL REVIEW

Weekly progress of the machinery and machine tool business

NEW YORK

New York continues its slow and halting progress, with inquiries still coming in, and leads still appearing for alert dealers to follow. Among the possibilities in the near future is a toolroom inquiry for International Business Machines at the Endicott, N. Y., plant. This is, of course, in the Syracuse territory. Several dealers expect a March better than either January or February, and the remainder expect it to at least hold even.

INDIANAPOLIS

While demand is somewhat spotty, the volume of business the first quarter will be more than during the same period a year ago. Some customers are out of the market almost entirely and others are buying only what is imperative. However, there is an improvement shown in other lines. Those dealers and manufacturers making contractors' equipment have little to worry about. The volume of this equipment to be bought this year will be large.

Quite a bit of machinery is being sold to sand and gravel plants and to some of the larger rock crushers in the state. At present, there are no important lists out for railroad equipment. Demand for tools from the automobile factories is slow. It appears certain that no great amount of business will be done this year with the iron and steel industry. Some of the plants are making inquiries, but they are curtailing all purchases. Some small equipment is being sold to the machine shops and garages. Shop equipment is being sold to airports also.

CHICAGO

While nothing outstanding has developed within the last week, a number of things have transpired that seemingly lend a brighter outlook. Among these is the fact that inquiries have taken a slight upward turn, and the closing of some sales long listed as prospective. There appears to be no expectation that there will be an early return to activity, but the belief is practically unanimous that from now on a definite, though slow, upward trend can safely be forecast, hence a more optimistic feeling prevails. As for some time past, railroad inquiry leads in importance. The Santa Fe is asking prices on a 10½-in. motor-driven cold saw, with a 24-in. saw. The Chicago Board of Education sends out another small list: an 18-in. band saw, a ½-in. capacity bench drill, an oil stone tool grinder, and a picture-frame machine. A report is current that an Ohio steel plant is in the market for a swing-frame grinder, the purchase to be made here. Demand for used tools shows some improvement.

BUFFALO

While the last fortnight has been rather unproductive of actual business, there is generally a rather optimistic tone among machine tool dealers. Inquiries seem to be much more pronounced than they were six weeks ago. There are more of them, from a wider variety of sources. Moreover, there seems to be really more business in sight from them than was the case with inquiries received earlier this year.

Employment conditions are better than last month and there is generally a better tone to industrial activities than has been the case at any time in a year and a half. It seems impossible to think that this condition will not be productive of machine tool orders.

Business still continues somewhat slow in the electrical lines related to industrial uses. The immediate future in this line does not look so well, but it is generally recognized that this line will immediately follow any marked advance in demand for machine tools. Demand for contractors' equipment is slow, but there are signs of a pick-up in the road-building business.

■

PROSPECTS are the week's major attractions in machine tool markets, for orders seem inclined to continue their spotty progress. March will show better totals than February, February showed slightly better totals than January, but the upward trend is so gradual that its influence from week to week is scarcely felt. As a consequence, the monthly betterment is received with thanksgiving, and not a little surprise.

NEW YORK is taking its first few toddling steps toward normalcy, with a number of good leads slowly becoming orders. Indianapolis is also banking on futures, expecting forthcoming upturns in sand and gravel, contractors', and associated shops, and some in airports, while the "old reliables," automobile, railroad, and iron and steel shops, have turned slow. Chicago, after several blue weeks, again feels spring in the air, with upturning inquiries and orders, railroad inquiry leading. Buffalo inquiries are up also, and from a wider variety of sources, with general employment gradually increasing. Cincinnati manufacturers showed a gain in March, and a gain last week, with selling agents continuing to share their attitude.

NEW ENGLAND seems slightly azure, with a March about the same as February, but good aeronautical prospects, and fair foreign demand. Canada reports moderate improvement in general business, with resulting betterment of the tool situation. Detroit tool sales have not kept pace with automotive production, for while production is increasing slowly, the feeling is still that the depression is not at an end—despite general improvement in indexes of business and a number of other favorable factors.

CINCINNATI

Machine tool manufacturers made some gain in sales in March. Several noted a shade of improvement the past week, and in no case was a diminished volume reported. Selling agents reported a slight gain last week and expressed the opinion that a better market is developing. The sustaining factor continued to be the sale of single tools and replacements to general machinists and miscellaneous users. Orders came from all sections of the country and requirements were well diversified. Inquiries were well scattered and well diversified, the major portion coming from general machinists and miscellaneous users. To a great extent the requirements were single items, and the buying was contingent on the improvement of the business of the inquirier or the securing of some special order.

NEW ENGLAND

Despite a much better tone through the closing days of March, it is doubtful if many companies did any better than in February. Sales have not picked up as rapidly as anticipated, and orders continue to be of the hitch-hike variety.

The aeronautical field is active with the Pratt & Whitney Aircraft Co. booking new orders for 68 Wasp engines and 60 radial air-cooled engines, totaling about $730,000. More orders from the Navy are expected by July.

Grinding machine builders are finding foreign sources the most dependable for present orders. Domestic interest has quickened somewhat but resulting orders are not reaching expectations. Lathes and drills are especially quiet.

CANADA

As a consequence of the better trend in practically all lines of business during the last fortnight, the outlook in the machinery and machine tool field is considerably improved. Orders for single tools have increased since the beginning of the month and inquiries are reported very encouraging. Moderate expansion is noted in industrial operations, steel producers being more active on substantial orders from the railroads. Some progress is registered in other manufacturing lines, and a fair number of skilled workers have been taken on. Structural steel is doing well, and electrical specialties are moving in larger volume. The demand for small power units and pumps is on the increase. In the Martime Provinces, agricultural implement sales show a slight increase, but in the West sales of farm machinery are very spotty. Production in the automotive field continues to show slight gains, with a corresponding increase in the demand for parts. Automobile production in February experienced relatively the sharpest monthly gain which has developed since February, 1928. In the building trades and related lines there are indications of a busy season ahead,

DETROIT

The machinery and machine tool trade has not kept pace with the advance of the automobile industry during the last four or five weeks, but dealers here believe they will feel the effect of the improvement in the near future.

March and April automotive production have far outrun the schedules for the first two months of the year. Of course the April program is still in its infancy, but the prospects for a large increase over March are encouraging. Perhaps the most optimistic phase of automobile recovery is the fact that cars are being manufactured only to meet consumer demand.

Many inquiries are being received for equipment and a large number of orders are awaiting only a release. The releases are not forthcoming very rapidly, the large companies apparently being uncertain whether it is wise to approve any expenditures at this time.

The general impression seems to be, among automobile manufacturers and contract jobbing shops, that the depression is not yet at an end. For this reason they are holding up many plans for expansion and for the replacement of obsolete or worn out machinery. The refrigerator industry is going at top speed and is using some machinery and tools. The tool trade as a whole is not very brisk and probably will not be until June. One of the larger automobile plants is spending $500,000 on a retooling job, one of the bright spots of the trade. Another concern, manufacturer of high-priced cars, is making expensive body changes and is also planning a new model which is likely to involve the purchase of considerable equipment.

BUSINESS • BAROMETER

Confidence will be re-established if the markets show that they can take care of themselves

THEODORE H. PRICE
Editor, Commerce and Finance, New York

ON MARCH 25, the *New York Times* published the following telegram from Manchester, N. H.:

"As a result of the receipt of large orders the Amoskeag Manufacturing Company is faced with a shortage of certain classes of textile workers and for the first time in several years the big factory has been forced to advertise for operatives.

"With the exception of one unit, all of the company's mills are now in operation.

"From all sections of the State word has come that the textile industry is showing definite signs of improvement.

"A number of the State's largest shoe plants are close to capacity and in several night work is going on.

"Shoe orders are reported to be 20 per cent above those a year ago."

This is the most important bit of business news that has appeared for some weeks. It is sure to make a very definite impression upon those who know anything of the conservative policy by which the Amoskeag management has been governed during the four or five years of depression from which the cotton textile industry now seems to be emerging.

The effect of this statement was immediately apparent, but it was negative rather than positive, as it had to meet the counterweight of the announcements attributed to the Federal Farm Board. These announcements have been variously interpreted, and there seems to be some room for a difference of opinion in regard to their exact significance. Public opinion is, however, agreed that it is not the intention of the Federal Farm Board to add to its holdings of cotton or wheat, and that the right to sell at least a portion of the supply now held may be exercised. The difficulty of getting at the facts of the situation adds to the doubt felt, and the trade is hoping for an early and definite statement from the government agencies involved.

Meanwhile a good deal of political interest in the question at issue is being displayed by those members of Congress who are politically minded. Some of them insist that the adoption of the export-debenture or equalization fee plan is now inevitable and others demand action that will be even more drastic. Therefore, it seems unlikely that the Government will sell much of the grain or cotton that it owns at a decline in prices, and with an improvement in trade it may be able to get even more than is now expected for its holdings.

It is undeniable that the situation will be relieved if the markets show that they can take care of themselves, and upon the assumption that the government economists will soon find an autogyro that will enable them to land safely, confidence is being re-established. A general resumption of activity is not, however, to be expected immediately, and there are still some directions in which the wheels of industry have not yet felt the acceleration of optimism. But the dark spots are not as numerous as they were, and the advertising men who compose what may be called "the vanguard of American business" report a decidedly increased interest on the part of distributors who understand the virtues of publicity.

Although it is but little higher, the money market is noticeably firmer and fore-handed business men who use large credit will do well to insure their requirements. The indicated advance in rates will be due to the diminishing tax collections, the increased expenditures on public works authorized to employ the unemployed, and the improvement in general business that appears to be in prospect.

The market for speculative stock is quieter, and the public seems to have made up its mind to avoid the rocks and whirlpools of marginal speculation for at least a few more months. This is particularly true of some of the industrial shares, although an improvement in the demand for automobiles has led to some buying of the motor stocks.

Foreign news is reassuring, but the French appear to be somewhat excited over the customs agreement between Austria and Germany that was announced last week. Its significance is not fully understood on this side of the Atlantic, and our political publicists do not appear to be much concerned.

Announcement that New South Wales has decided not to pay $3,646,000 interest due British bondholders April 1st, but was preparing to pay $627,000 interest due New York bondholders caused a slump in Australian bonds in general and New South Wales bonds in particular. London sees no justification for the default, but the ill-balanced trade of the continental island and the decline in prices of its export productions seem to have left no other course open.

Railroad earnings and bank clearings in the United States continue to run under last year, but a great many believe that what financial writers call 'fundamentals" are sound. If the springtime brings a substantial reduction in the number of those who are unemployed, we ought to have a summer of prosperous activity.

THE BUSINESS WEEK

April 1, 1931

The delicate balance of business convalescence has been a bit disturbed this week by the rumbling of renewed political rumpuses here and abroad. . . . The threatened revival of farm relief agitation by the Farm Board's abandonment of price pegging is politically pessimistic, but fundamentally favorable for business readjustment. . . . The row over the German-Austrian effort to translate French rhetoric into reality, however, exposes again the volcano of political passion upon which European economic stability is precariously perched and clinches the conviction that American business recovery must come from the cultivation of our own cabbage patch. . . . Governor Norman's visit here holds some hope of international action on a scale comprehensive enough to overcome the credit crisis which uncontrolled price deflation has precipitated. . . . Domestic developments are still dubious. . . . Our index, down slightly this week to 81% of normal, shows no significant change in the stagnant statistical picture. . . . Hesitancy in steel activity, renewed weakness in commodity prices, and softness in the still selective bond market indicate that confidence in continuous recovery or initiative in the adventure of creating new wealth is still crippled by the paralyzing pressure of the deflation complex which has prolonged the depression.

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THE WEEKLY PRICE GUIDE . . . .

Rise and Fall of the Market

LAST week's rise of 5c. per 100 lb., to $1.70, base, Pittsburgh, has brought forth no new demand in steel. Construction still leads in steel buying but the railroads have stepped up into second place, ahead of the automobile industry. Other lines remain quiet, with prices extremely weak. Steel-sheet prices are declining. Substantial reductions in shapes, plates, bars, etc., have occurred of late in lots as large as 4 tons, out of warehouse stock. Copper wire is off ¼c. per lb., to 11¾c. Non-ferrous scrap held steadily this week, with the exception of zinc, which fell ¼c. per lb., to 1¼c. Solder, as an exception, advanced ½c. per lb., to 22½c., at New York warehouses.

(All prices as of Mar. 27, 1931)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI:	
Ala. Foundry (Silicon, 1.75@2.25)	$14.69@$15.19
Tenn. Foundry (Silicon, 1.75@2.25)	14.69@ 15.19
NEW YORK:	
Buffalo No. 2 Fdry. (Silicon, 1.75@2.25)	18.25
BIRMINGHAM:	
No. 2 Foundry (Silicon 1.75@2.25)	12.00@13.00
PHILADELPHIA:	
Eastern Pa., No. 2x (Silicon, 2.25@2.75)	17.76
Virginia No. 2 (Silicon, 1.75@2.25)	17 75
Basic	17.75
CHICAGO:	
No. 2 Foundry, Northern (Silicon, 1.75@2.25)	17.50
No. 2 Foundry, Southern	17.01
PITTSBURGH:	
No. 2 Foundry	18.13@18.63
Basic	18.13@18.63
Bessemer	18.63@19.13

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.00
Cleveland	4.75
Cincinnati	4.45
New York	4.75
Chicago	4.50@4.75

STEEL SHEETS—Quotations are in cents per pound for sheets from warehouse stock; also the mill base in large lots:

Blue Annealed*	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	1.90	3.35†	3.00	3.30†
No. 12	1.95	3.45†	3.10	3.35†
No. 14	2.05	3.55†	3.20	3.40†
No. 16	2.15	3.65†	3.30	3.50†
Black				
Nos. 18 to 20	2.15	3.60†	3.40	3.30
No. 22	2.30	3.75†	3.55	3.45
No. 24	2.35	3.80†	3.60	3.50
No. 26	2.45	3.90†	3.70	3.60
No. 28	2.60	4.05†	3.85	3.75
Galvanized				
No. 10	2.20	3.65†	3.50	3.35
Nos. 12 to 14	2.30	3.75†	3.60	3.40
No. 16	2.40	3.85†	3.70	3.50
No. 18	2.55	4.00†	3.85	3.65
No. 20	2.70	4.15†	4.00	3.80
No. 22	2.75	4.20†	4.05	3.85
No. 24	2.90	4.35†	4.20	4.00
No. 26	3.15	4.60†	4.35	4.25
No. 28	3.40	4.85†	4.70	4.50

*Light Plates. †400 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. butt..	56.14%	43.6%	53.3%	42.3%	57.3%	44.8%
3½ to 6 in. lap..	52.72%	40.18%	50.8%	37.8%	53.9%	41.4%

List prices on which foregoing discounts apply, are as follows:

Size, Inches	List Price per Foot	—Diameter in Inches— External	Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.275	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.585	2.875	2.469	.203
3	.765	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28
8	2.50	8.625	8.071	.277

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

—Thickness—		—Outside Diameter in Inches—						
		½	⅝	¾	⅞	1	1⅛	1¼
Inches	B.w.g.	Price per Foot						
.035	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049	18	.17	.18	.19	.20	.21	.23	.25
.065	16	.19	.20	.21	.22	.23	.25	.27
.083	14	.20	.22	.23	.24	.25	.27	.29
.095	13	.21	.23	.25	.26	.27	.29	.31
.109	12	.22	.24	.26	.27	.28	.30	.32
.120 or .125	11	.23	.25	.27	.28	.29	.31	.33
.134	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	7.00	6.00	6.15
Hoop steel	3.65**	4.00	3.65†
Cold rolled strip steel	4.95	6.00	6.10
Floor plates	4.75**	5.30	5.00†
Cold fin., round or hexagon‡	3.40	3.65	3.35
Cold fin., flat or square‡	3.90	4.15	3.85
Structural shapes	3.00**	2.95	3.00†
Soft steel bars and bar shapes	3.00**	2.95	2.90†
Soft steel bands	3.30**	3.20	3.10†
Rivets, structural or boiler	4.25	....	4.00
Tank plates	3.00**	3.00	3.00†
Bar iron (2.75 at mill)	3.00**	3.00	2.90†
Drill rod (from list)	65%	55%	60%

*Flat, $\frac{3}{16}$-in. thick by ¾-in. wide. **400 to 999 lb. †400 to 3,999 lb., ordered and released for shipment at one time. ‡Cold finished steel, shafting and screw stock.

Electric welding wire at New York warehouse—$\frac{3}{32}$, 8.35c. per lb.; ⅛, 7.85c. per lb.; $\frac{5}{32}$ to ½, 7.35c. per lb.

METALS

Warehouse Delivery Prices in Cents Per Lb. for Small Lots:

Copper, electrolytic, New York			11.50@12.00
Tin, Straits, pigs, New York			29.50@30.50
Lead, pigs, E. St. Louis	4.25	New York	5.50 @6.50
Zinc, slabs, E. St. Louis	4.00	New York	5.50 @6.50

	New York	Cleveland	Chicago
Antimony, slabs	10.00@10.50	10.50	10.75
Copper sheets*	20.37½	19.87½	20.00
Copper wire*	11.75	11.87½	11.87½
Copper, drawn, round*	18.87½	18.87½	18.50
Copper tubing*	22.87½	22.37½	22.50
Brass sheets, high*	17.62½	17.25	17.37½
Brass tubing, high*	22.50	22.12½	22.25
Brass rods, high*	15.87½	15.50	15.62½
Brass wire, high*	17.75	17.75	17.87½

*Mill, base.

SHOP MATERIALS AND SUPPLIES

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%†.....	24.00@25.00	24.30	23.30
Zinc sheets (casks).....	9.75@10.25	11.25	10.36
Solder (½ and ½).....	22.50	21.50	18@20
Babbitt metal, delivered in case lots, New York, cents per lb.:			
Genuine, highest grade.....			45.25
Commercial genuine, intermediate grade.....			34.25
Anti-friction metal, general service.....			29.00
No. 4 babbitt, f.o.b.....			10.00

†F.O.B.

NICKEL AND MONEL METAL—Price in cents per lb., base, f.o.b. Huntington, W. Va.:

	Nickel	Monel Metal
Sheets, full finished.....	52.00	42.00
Sheets, cold rolled.....	60.00	50.00
Strip, cold rolled.....	55.00	45.00
Rods, hot rolled.....	45.00	35.00
Rods, cold drawn.....	50.00	40.00
Tubing.....	75.00*	90.00†
Angles, hot rolled.....	50.00	40.00
Plates.....	52.00	42.00

*Seamless. †Welded.

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars:

	New York	Cleveland	Chicago
Crucible copper.....	8.00	7.75	7.25@ 7.75
Copper, heavy, and wire..	7.25	7.50	6.75@ 7.25
Copper, light, and bottoms	6.25	6.50	6.00@ 6.50
Heavy lead.....	3.25	3.50	3.00@ 3.50
Lead battery plates.....	1.25	2.50	2.00@ 2.50
Brass, heavy, yellow.....	4.25	4.50	4.00@ 4.50
Brass, heavy, red.....	6.75	7.00	6.25@ 6.75
Brass, light.....	3.50	3.25	3.50@ 4.00
No. 1 rod-brass turnings.	4.50	4.50	4.25@ 4.75
Zinc.....	1.25	1.50	1.25@ 1.50

TIN PLATES—Charcoal—Bright—Per box:

"AAA" Grade:	New York	Cleveland	Chicago
IC, 14x20.....	$12.10.	$11.95	$11.50
"A" Grade:			
IC, 14x20.....	9.70	9.90	9.50
Coke Plates—Primes—Per box:			
100-lb., 14x20.....	6.45	6.10	7.00
Terne Plates—8-lb. Coating—Small lots—Per box:			
IC, 14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.....	$0.13	$0.16	$0.15
Cotton waste, colored, per lb....	.09½	.12	.10
Wiping cloths, washed, white, per lb.....	.15	38.00 per M	.14½
Sal soda, per lb.....	.01½	.02	.02
Roll sulphur, per lb.....	.028	.03	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb.....	.10	.099	.104
Cutting oil, about 25% lard, in 5 gal. cans, per gal.....	.75	.60	.60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.....	.33	.36	.24
Belting—Present discounts from list in fair quantities (½ doz. rolls) for leather or rubber:			
Leather—List price, 24c. per lin.ft., per inch of width, for single ply:			
Medium grade.....	30–10%	30–10%	50%
Med. grade, heavy wgt.....	30%	30 –5%	40%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade.....	70%	50–10%	60%
Second grade.....	65–5%	60– 5%	65%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb.	$0.025	$0.031	$0.0325
Cold fin. shafting....	per lb.	.034	.034	.034
Brass rods.....	per lb.	.1587½	.1562½	.2125
Solder (½ and ½).....	per lb.	.225	.22	.275
Cotton waste, white..	per lb.	.13	.13	.13
Disks, aluminum oxide mineral, cloth, No. 1 6-in. dia.....	per 100	4.59	4.59	4.59
Lard cutting oil.....	per gal.	.75	.75	.75
Machine oil.....	per gal.	.33	.33	.33
Belting, leather, medium.....	off list	30–10%	30–10%	30–10%
Machine bolts, up to 1x30 in., full kegs....	off list	65–10%	65–10%	50–10%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials — Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper*.....	$6.03	$6.03	$6.03
Emery cloth*.....	25.87	25.87	25.87
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper†.....	2.61	2.61	2.61
Cloth†.....	4.59	4.59	4.59
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton....	Connellsville,		2.50
Coke, prompt foundry, per net ton....	Connellsville,		3.25
White lead, dry.....	100 lb. kegs...	New York,	13.25
White lead, in oil.....	100 lb. kegs...	New York,	13.25
Red lead, dry.....	100 lb. kegs...	New York,	13.25
Red lead, in oil.....	100 lb. kegs...	New York,	14.75

*Less than 3 reams. †Less than 200.

SHOP SUPPLIES

Discounts from list, applying on immediate deliveries from warehouse stocks in New York and vicinity:

Machine bolts:	
Up to ¾-in. x 6-in., full kegs, list less.....	65–10%
Larger, up to 1 x 30-in., full kegs, list less.....	65–10%
Less than full kegs or case lots, add to list.....	10%
Fitting-up bolts: list less.....	45%
Lag screws:	
Up to ½-in. x 6-in., list less.....	65–10%
Larger, list less.....	65–10%
Less than full keg or case lots, add to list.....	10%
Rivets:	
Structural, round head, full kegs, net.....	$4.25
Structural, round head, broken kegs, net.....	5.75
Tank, $\frac{7}{16}$-in. dia. and smaller, list less.....	60–10%
Nuts:	
Hot pressed, square or hexagonal, blank or tapped:	
Full kegs up to 1-in., incl., list less.....	65–10%
Larger, up to 3-in., list less.....	65–10%
Less than keg or case lots, add to list.....	10%
Washers:	
Wrought, full kegs, per 100 lb., list less.....	$3.50
Wrought, broken kegs, per 100 lb., list less.....	1.50
Turnbuckles:	
With stub ends, list less.....	20–10%
Without stub ends, list less.....	55%
Chain:	
Proof coil, base, per 100 lb., net.....	$8.50
Cast iron welding flux, per lb., net.....	.35
Bronzing flux, per lb., net.....	.50

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Equipment Wanted

Ind., Pentleton—Hardy Mfg. Co.—heat treating machinery for the manufacture of metal stampings, for proposed addition to plant. $20,000.

Mass., Boston—Bureau of Supplies & Accounts, Navy Dept., Washington, D. C.—will receive bids until Apr. 7 for lumber and electric furnace for Navy Yard here.

Mo., Robertson—Bureau of Supplies & Accounts, Navy Dept., Washington, D. C.—will receive bids until Apr. 14 for tool room lathe at Naval Reserve Aviation Base here.

Tex., San Antonio—Bd. of Education, Lavaca and Water Sts.—machinery and equipment to cost $50,000 for shops for proposed 1 story industrial school building at Romana and Main Sts.

Ont., Rodney—Canada Wood Products Co.—interested in prices on complete new equipment for the manufacture of fruit and berry baskets and boxes for plant recently destroyed by fire. Loss $100,000.

N. Z., Wellington—New Zealand Government Railroads—will receive bids until June 19 for a 10 ton traveling crane.

Opportunities for Future Business

Ala., Montgomery — Constructing Quartermaster, awarded contract for the construction of air corps warehouse, machine and assembly shops at Maxwell Field. $61,450. Noted Mar. 26.

Calif., Los Angeles — Downtown Business Men's Association, plans the construction of a 3 story garage at Pershing Sq. Estimated cost $1,000,000. E. T. Heitschmidt, 807 Subway Terminal Bldg. and S. C. Lee, 2404 West 7th St., Archts.

Calif., Santa Barbara—Lighthouse Supt., San Francisco, received lowest bid for the construction of shop buildings, light tower, etc. at Anacapa Island from M. W. Lippman, 4344 South Arling St., Los Angeles. $74,595.

Conn., New London—Bureau of Yards & Docks, Navy Dept., Washington, D. C., will soon award contract for the construction of a Diesel engine laboratory at Submarine Base here. Estimated cost to exceed $40,000. Private plans.

Ill., East St. Louis—Goodrich Silvertown Inc., c/o R. E. Kenner, Zone Mgr., St. Louis, awarded contract for a 2 story, service station at 9th St. and St. Louis Ave. here. $40,000. Owner will soon let contract for similar stations in vicinity of Delmar and Skinker Blvd. and Grand Blvd. and Gravois Ave. in St. Louis.

Ind., Anderson—Smith Steel Castings Corp., C. Smith, Pres., and R. E. Dudley, in charge of metals, will open foundry in old Lavelle No. 2 plant at Jefferson St. and C. I. Railway and will install modern machinery and equipment.

Ind., Bloomfield — Marrah Mfg. Co., manufacturers of tools, awarded contract for the construction of a 1 story, 50 x 115 ft. factory at Spring and Jefferson Sts. Estimated cost $42,000.

Ind., East Chicago—School Commissioners are having preliminary plans prepared for the construction of an industrial grade and high school including shops, etc., at 1610 East 140th St. Estimated cost $350,000. Architect not selected.

Ind., Indianapolis—G. J. Mayer Co., 36 South Meridian St., awarded contract for addition to factory for the manufacture of stamps at Liberty and Market Sts. Estimatedcost $40,000.

Ind., South Bend—Standard Oil Co., had plans prepared for the construction of a service station at McKinley and Ironwood Dr. Estimated cost $40,000. Private plans.

Md., Baltimore—Hock & Volk Brass Foundry, c/o G. S. Hock and R. K. Volk, has work under way on the construction of a foundry for production of brass, bronze and aluminum castings.

Md., Baltimore—August Maag Co., Haven and Fleet Sts., manufacturers of bakers' utensils, operated by Katzinger Co., 1909 North Cicero Ave., Chicago, Ill., will build a 2 story, 80 x 140 ft. addition to plant here.

Mass., Dorchester (sta. Boston)—J. A. Singarella, Park Sq. Bldg., Boston, is having sketches made for a 1 story, 50 x 105 ft. garage and office at Mt. Vernon St. here. Estimated cost $45,000. Private plans.

Mass., Everett (Br. Boston)—Standard Oil Co. of New York, Park Sq. Bldg., Boston, awarded contract for the consrtuction of a service station, etc., at Broadway and Ferry St. here.

Mass., Jamaica Plain (sta. Boston)—Boston Consolidated Gas Co., 250 Stuart St., Boston, is having preliminary sketches made for the construction of a garage, warehouse and service yard at McBride, Washington and Water Sts. here. Estimated cost $50,000. D. S. Reynolds, Co. Engr.

Mass., New Bedford—Continental Wood Screw Co., 459 Mount Pleasant St., will build a 2 story, 50 x 100 ft. plant. Estimated cost $45,000. Private plans.

Mass., South Lee—D. D. Hopkins Lumber Co., will build a 1 story, 60 x 160 ft. woodworking plant. Estimated cost $75,000 including equipment. Private plans.

Mo., St. Louis—A. E. Black, 801 Louderman Bldg. awarded contract for a 1 and 2 story, 102 x 142 ft. garage and warehouse at 1024-26 North 25th St. Beatrice Creamery Co., 2119 Morgan St., lessee.

Mo., St. Louis—James R. Kearney Corp., 4320 Clayton Ave., awarded contract for a 3 story, 100 x 105 ft. addition to plant for the manufacture of underground and overhead electrical equipment and safety tools for handling high tension wires.

N. J., East Orange — Rocco Realty Co., M. Rousek, Mgr., 507 Main St., will not construct 3 story auto laundry and garage at Main and North Arlington Sts. Estimated cost $150,000. Project in abeyance. Noted Mar. 19.

N. J., East Rutherfood (br. Rutherford)—L. B. Huesman and J. Dynes, 13 Orient Ave., Rutherfood, Archts., are receiving bids for a 2 story, 50 x 120 ft. garage and repair shop on Morton St. here for Craig Coal Co., 10 Park Ave., Rutherford Estimated cost $40,000.

N. J., North Bergen—Bd. of Council, Town Hall, will not construct a 2 story garage, signal station, etc. Estimated cost $150,000. R. B. Glenn, Town Hall, Archt. and Engr. Project abandoned. Noted Jan. 22.

N. J., Ridgefield Park—Continental Paper Co., River Rd., Bogota, will soon award contract for two 2 story buildings for paper plant here. Estimated cost $40,000. Johnson & Wierk, Grand Central Terminal, New York, N. Y., Archts.

N. Y., Brooklyn—Atlantic & Classon Ave. Corp., 26 Court St., A. Kaplan, Pres., plans a 1 story, 100 x 100 ft. service garage, etc., at Atlantic and Classon Aves. Estimated cost $40,000. W. A. Lacerenza, 26 Court St., Archt.

N. Y., Brooklyn—International Cork Co., c/o I. Adelsohn, 44 Court St., archt., is having sketches made for a 2 story, 100 x 200 ft. plant at Morgan and Norwalk Aves. Estimated cost to exceed $40,000.

N. Y., Brooklyn—Long Island R.R. Co., Pennsylvania Station, New York, is having plans prepared for a 1 story, 110 x 210 ft. service garage at Ocean Ave. and Ave. H here. Estimateed cost to exceed $60,000. F. H. Klie, 250 Park Ave., New York, Archt. Maturity about July 1 or later. Noted Mar. 19.

N. Y., Dongan Hills — Dept. of Hospitals, Municipal Bldg., New York, will receive bids about Aug. 1 for the construction of a garage and repair shop at Sea View Hospital here. Sibley & Fetherston, 205 East 42nd St., New York, Archts.

N. Y., Flushing — Faw Realty Co., 1810 Myrtle Ave., Ridgewood, will build a service garage at Lawrence St. and Avery Ave. here. Estimated cost $40,000. H. Brucker, 1037 Kossuth Pl., Glendale, Archt. Work will be done by separate contracts. Maturity in August. Noted Mar. 19.

N. Y., Jamaica—Aluminate Co., 135-26 Hillside Ave., will build a manufacturing plant at 132nd St. and 91st Ave. Estimated cost to exceed $40,000. H. J. Jeffery, 90-50 Parsons Blvd., Archt. Work will be done by day labor and separate contracts. Noted Mar. 19.

N. Y., New York—Star So., 200 South St., postponed construction of a warehouse and industrial building at 419 Water St. Estimated cost $95,000. Lockwood, Greene Engineers Inc., 1001 East 42nd St., Archts. and Engrs. Porject in abeyance until May 1 when contract will be awarded. Noted Feb. 19.

O., East Liverpool—C. C. Thompson Pottery Co., awarded contract for a 2 story, 50 x 150 ft. pottery plant to house new tunnel kiln on River Rd. Estimated cost $50,000.

Pa., Pittsburgh—Mayer Body Co., W. G. Mayer, Pres., 6459 Frankstown Ave., awarded contract for two additions to plant, 1 story, 30 x 100 ft. and 2 story, 50 x 100 ft. at 6461 Frankstown Ave. Estimated cost $40,000. Noted Mar. 12.

Pa., Pittsburgh—Smith Faris Co., R. I. Smith, Pres., 1150 Hogdkiss St., (asbestos) awarded contract for a 1 story, 26 x 82 ft. manufacturing plant at 1159 Hodgkiss St. Estimated cost $40,000.

Pa., Wilkes Barre—Central Poor District of Luzerne County, G .K. Brown, Secy., 54 West Union St., will receive bids until Apr. 9 for a 3 story service building. Estimated cost to exceed $150,000. A. L. Reilly, 58-59 Bennett Bldg., Archt.

Tenn., Athens — East & West Desk Co., J. Ruffner, Pres., acquired a site and plans the construction of a desk factory near Southern tracks.

Tex., Bryan—Stevenson Machinery Co., plans reconstruction of plant recently destroyed by fire including machinery for assembling equipment. Private plans.

Utah, Salt Lake City—U. S. Veterns Bureau, Washington, D. C., will receive bids until April 30 for main building, garage building, etc., at U. S. Veterans Hospital here. $400,000.

Va., Hampton Roads—Bureau of Yards & Docks, Navy Dpt., Washington, D. C., awarded contract for a 160 x 203 ft. addition to hangar and shop building here. $82,697. Noted Mar. 26.

W. Va., Charleston — Appalachian Electric Power Co., received lowest bid for the construction of a garage from L. H. Keeney, $63,445.

Wis., Milwaukee — Descro Co., St. Paul St., will soon award contract for a 2 story, 110 x 175 ft. warehouse and office. N. P. Bockes, 808 North 3rd St., Archt.

N. S., Halifax—Neon Tube Gas & Electric Sign Co. Ltd., plans the construction of a plant for the manufacture of illuminated signs. Estimated cost $50,000 to $75,000. Noted Mar. 5.

Ont., Alfred—Christian Bros., 373 Sussex St., Ottawa, is having plans prepared for a 2 or 3 story industrial school here. Estimated cost $200,000. A. J. Hazelgrove, 63 Sparks St., Ottawa.

Ont., St. Catherines—Welding & Engineering Ltd., W. Cockran, Mgr., plans the construction of a plant for the manufacture of cream separators, etc.

Ont., Toronto—Blythwood Motors Ltd., Blythwood and Yonge Sts., awarded contract for a 1 and 2 story garage and service station. Estimated cost $150,000.

Ont., Welland—A. W. De La Plante Co., plans to rebuild woodworking and machine shop recently destroyed by fire. Loss $35,000.